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FM 101-10-1

DEPARTMENT OF THE ARMY FIELD MANUAL

S/S Jan 69

STAFF OFFICERS' FIELD MANUAL ORGANIZATION, TECHNICAL, AND LOGISTICAL DATA UNCLASSIFIED DATA

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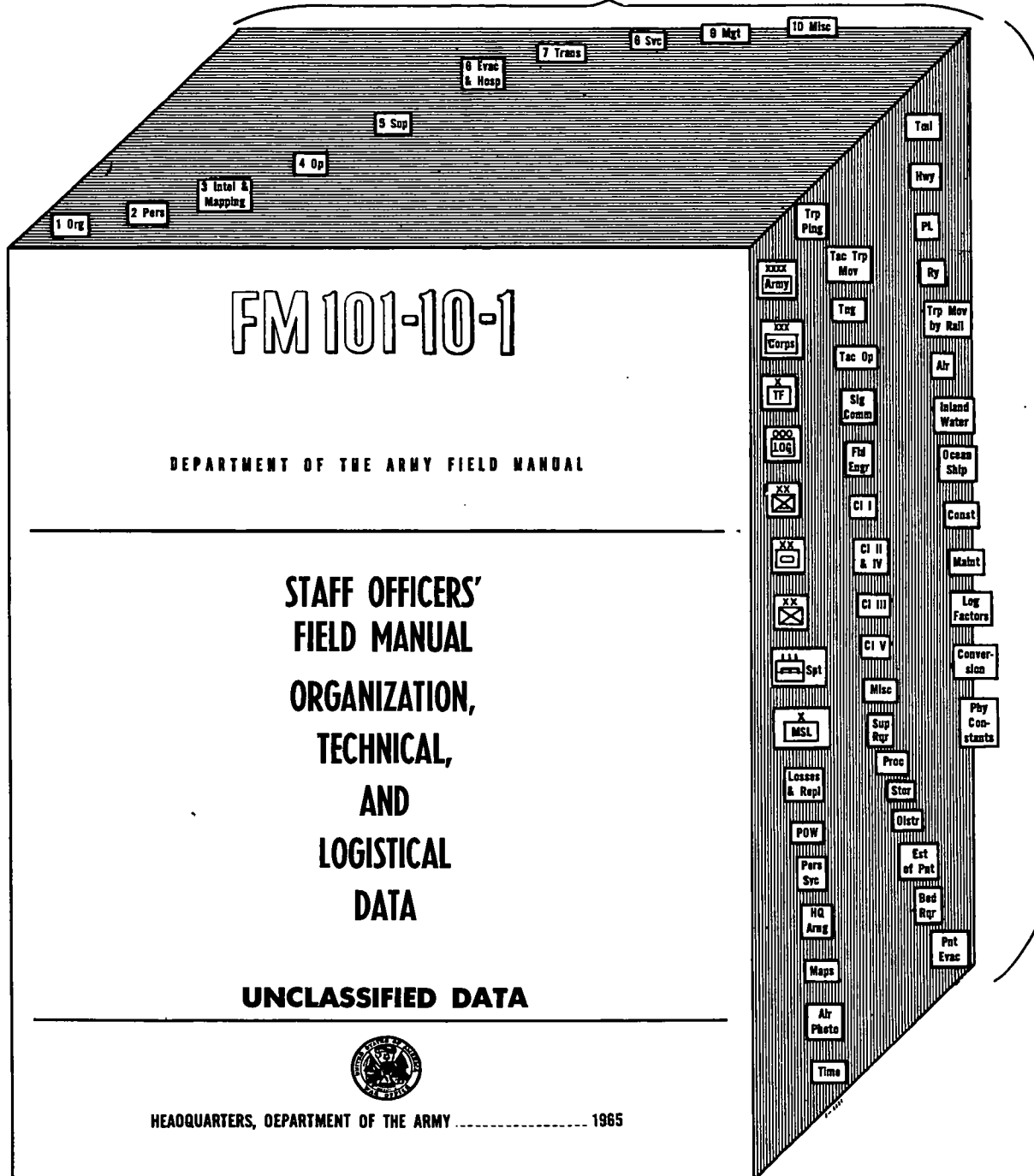
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HEADQUARTERS, DEPARTMENT OF THE ARMY
JANUARY 1966

SUGGESTED METHOD OF PLACING INDEX TABS

Place Chapter Number Tabs on Top of Manual



Place Section Tabs Along Right Edge of Manual

Chapter number and abbreviated title appear at the top of the page and are attached to the first page of the chapter. (Chapter separators of cover stock may be inserted between chapters if desired.) Abbreviated section titles within a chapter appear at the side of the manual and are attached to the page on which the particular section begins.

FOREWORD

FM 101-10, *Staff Officers' Field Manual—Organization, Technical, and Logistical Data*, consists of three parts published as separate volumes.

FM 101-10-1—Unclassified Data

FM 101-10-2—Extracts of Tables of Organization and Equipment

FM 101-10-3—Classified Data

FM 101-10-1

This volume is for use as a planning guide only. It provides general planning data for staff officers of all echelons. Detailed reference data are found in tables of organization and equipment, field manuals, technical manuals, technical bulletins, and supply bulletins as outlined in DA Pam 310-series. The principles and procedures of combat service support are contained in FM 100-10; the duties of staff officers and the principles and procedures of staff action are contained in FM 101-5.

When tons are shown, the short ton (2,000 lb) is intended unless the long ton (2,240 lb) or the measurement ton (40 cu ft) is specified.

For meaning of abbreviations and symbols used in this manual, see AR 320-50 and FM 21-30.

Caution: Data contained in this volume are based on experience principally from World War II and the Korean Conflict and can be applied to the future only with judgment and discrimination. Planning factors should be modified, as appropriate, to reflect specific requirements of mission, environment, enemy capabilities, and nuclear conditions. Whenever known factors are available, they should be used rather than those from this volume. This volume is applicable to nuclear and nonnuclear warfare.

Tables and examples in chapters 1 through 9 are not, in all cases, based on latest tables of organization and equipment, and computations must be adjusted accordingly.

Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded direct to Commanding General, United States Army Combat Developments Command Combat Service Support Group, Fort Lee, Va. 23801.

United States Army Combat Developments Command Combat Service Support Group will prepare and process changes to this manual on an annual basis. (See AR 310-3 for desired format of recommendations for corrections and changes.)

Source data cutoff date for material contained in this volume is 1 July 1964.



FIELD MANUAL

No. 101-10-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 28 January 1966

Staff Officers' Field Manual

ORGANIZATION, TECHNICAL, AND LOGISTICAL DATA
UNCLASSIFIED DATA

	Paragraphs	Page
CHAPTER 1. ORGANIZATION		
Section I. General -----	1-1-1-4	1-1
II. Field army, corps, task force, and logistical command -----	1-5-1-8	1-3
III. Airborne division -----	1-9-1-11	1-12
IV. Armored, mechanized, and infantry division -----	1-12-1-15	1-16
V. Armored division -----	1-16-1-17	1-21
VI. Infantry division -----	1-18-1-19	1-24
VII. Mechanized division -----	1-20-1-21	1-27
VIII. Engineer shore assault units -----	1-22-1-25	1-30
IX. US Army missile command -----	1-26-1-27	1-38
X. Special forces group, airborne -----	1-28	1-41
CHAPTER 2. PERSONNEL		
Section I. General -----	2-1	2-1
II. Losses and replacements -----	2-2-2-7	2-1
III. Enemy prisoners-of-war and civilian internees -----	2-8-2-12	2-19
IV. Personnel services -----	2-13-2-15	2-22
V. Chaplain combat service support -----	2-16-2-17	2-23
VI. Internal arrangement of headquarters -----	2-18-2-21	2-24
VII. Crime rates and military prisoners -----	2-22-2-23	2-30
CHAPTER 3. INTELLIGENCE—MAPPING AND AERIAL PHOTOGRAPHY		
Section I. General -----	3-1-3-3	3-1
II. Mapping -----	3-4-3-11	3-1
III. Aerial photograph -----	3-12-3-14	3-9
IV. Expressing time, dates, and natural phenomena -----	3-15, 3-16	3-13
V. The world geographic reference system -----	3-17, 3-18	3-19
CHAPTER 4. OPERATIONS		
Section I. Troop planning -----	4-1-4-7	4-1
II. Tactical troop movements -----	4-8-4-13	4-31
III. Training areas and facilities -----	4-14-4-16	4-82
IV. Tactical operations -----	4-17-4-18	4-84
V. Signal communications -----	4-19-4-26	4-101
VI. Field engineering -----	4-27-4-34	4-110

*This manual supersedes FM 101-10, part I, 25 October 1961.

	Paragraphs	Page
CHAPTER 5. LOGISTICS—SUPPLY		
Section I. General -----	5-1, 5-2	5-1
II. Class I supply -----	5-3, 5-4	5-2
III. Class II and IV supply—dimensions and weights (not all inclusive) -----	5-5—5-12	5-4
IV. Class III supply -----	5-13—5-24	5-24
V. Class V supply -----	5-25—5-45	5-48
VI. Miscellaneous supply -----	5-46—5-51	5-106
VII. Supply requirements -----	5-52—5-62	5-113
VIII. Procurement -----	5-63	5-127
IX. Storage -----	5-64—5-74	5-127
X. Distribution -----	5-75—5-79	5-137
CHAPTER 6. LOGISTICS—EVACUATION AND HOSPITALIZATION		
Section I. Estimate of patients -----	6-1—6-5	6-1
II. Fixed-bed requirements -----	6-6—6-9	6-4
III. Patient evacuation -----	6-10—6-12	6-11
CHAPTER 7. LOGISTICS—TRANSPORTATION		
Section I. General -----	7-1—7-4	7-1
II. Terminals -----	7-5—7-9	7-3
III. Highway transport -----	7-10—7-13	7-18
IV. Pipelines -----	7-14—7-15	7-23
V. Railways -----	7-16—7-26	7-24
VI. Movement of troop units by rail -----	7-27—7-39	7-29
VII. Air transportation -----	7-40—7-43	7-41
VIII. Inland waterways -----	7-44—7-46	7-50
IX. Ocean shipping -----	7-47—7-54	7-52
X. Miscellaneous transport -----	7-55—7-58	7-65
CHAPTER 8. LOGISTICS—SERVICE		
Section I. General -----	8-1—8-3	8-1
II. Construction -----	8-4—8-13	8-2
III. Maintenance -----	8-14—8-19	8-29
CHAPTER 9. LOGISTICS—MANAGEMENT		
Section I. General -----	9-1, 9-2	9-1
II. Logistical factors -----	9-3—9-7	9-2
CHAPTER 10. MISCELLANEOUS		
Section I. Conversion factors -----	10-1—10-7	10-1
II. Physical constants -----	10-8—10-13	10-3
APPENDIX REFERENCES -----		A-1
INDEX -----		I-1

CHAPTER 1 ORGANIZATION

Section I. GENERAL

1-1. Department of the Army—Organization (fig. 1-1)

1-2. Army Areas and U. S. Army Air Defense Commands

a. Army Areas (fig. 1-2).

b. U.S. Army Air Defense Commands (fig. 1-3).

1-3. Theater Army

a. General. U.S. theater Army headquarters is the senior U.S. Army headquarters in a theater of operations. In a theater where only U.S. forces comprise the theater command, U.S. theater Army headquarters is charged with the overall supervision of strategic, tactical, administrative, and logistical operations of all U.S. Army elements. When the theater is organized as a combined command, U.S. theater Army headquarters becomes for all practical purposes, an administrative headquarters for the support of U.S. Army forces only.

b. Composition.

- (1) *Headquarters.* There is no prescribed organization for headquarters, theater army. It consists of the headquarters elements necessary to provide command and control of assigned forces. The allotment and grouping of these forces is based upon the mission assigned.
- (2) *Assigned forces.* Forces assigned to U.S. theater army may consist of—
 - (a) Combat forces—army groups, field armies, separate corps, and, in some cases, divisions.

(b) Theater army logistical command (TALOG), with its logistical commands.

(c) Theater army civil affairs command.

(d) Theater army air defense command.

(e) U.S. Army unconventional warfare forces.

(U.S. Army unconventional warfare forces are normally assigned to the unified command. As required, the unified commander has authority to establish a Joint Unconventional Warfare Task Force (JUWTF) to plan for and to conduct unconventional warfare operations within his area of responsibility. However, when the area of influence of the advancing field army includes an unconventional warfare area, operational control and combat service support of the overt UW force (guerrilla element) is usually transferred to the field army.) (See FM 31-21.)

1-4. Army Group

a. General. The army group is organized to direct the strategic and tactical operations of two or more field armies or similar tactical groupings. When only U.S. forces comprise the theater command, army group, if employed operates under the direct control of the U.S. theater army commander. When operating as a part of a multinational theater, strategic direction may originate in a superior land force headquarters.

Figure 1-1
[Located in back of manual.]

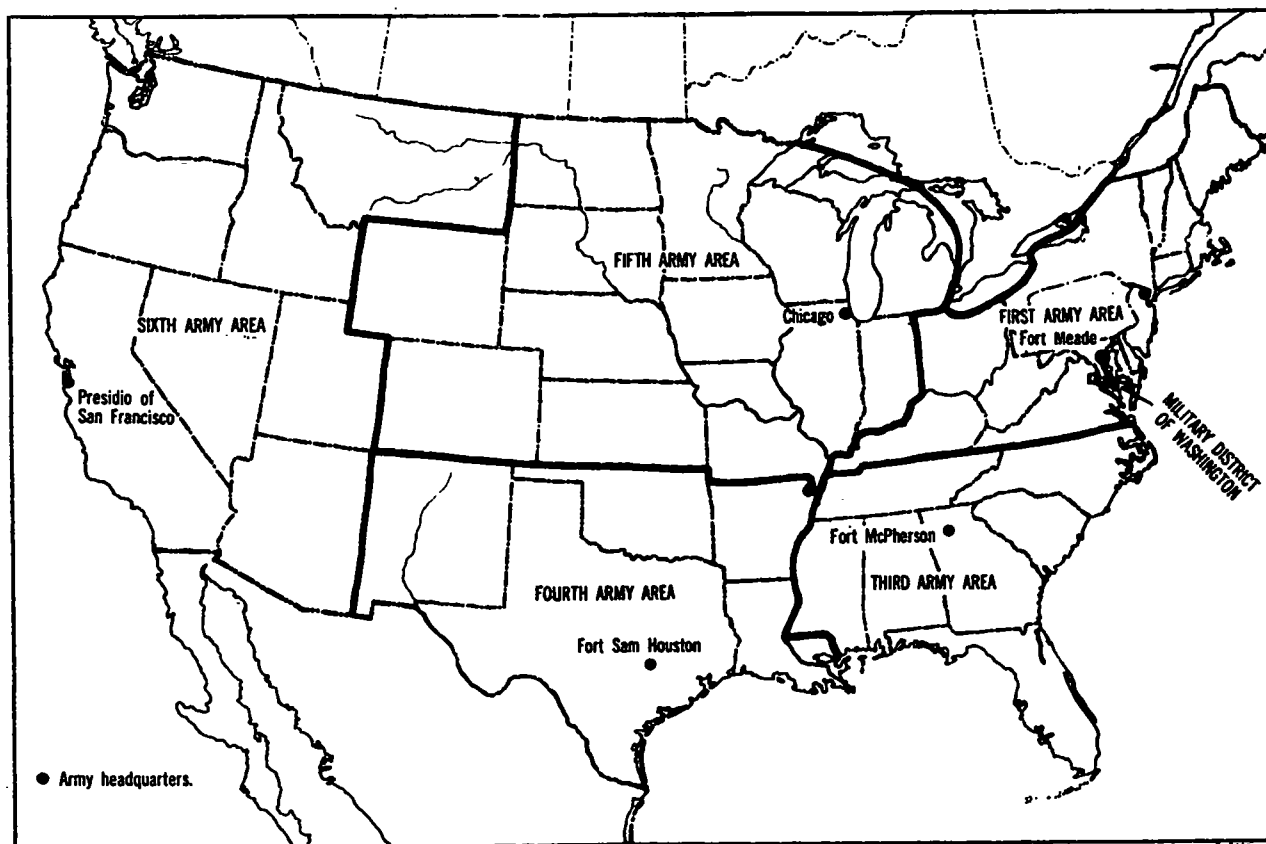


Figure 1-2

b. Composition.

(1) *Headquarters.* There is no prescribed organization for headquarters, army group. It is provided the headquarters elements necessary to exercise strategic and tactical control of its assigned forces. Army group does not

normally operate combat service support elements.

- (2) *Assigned forces.* Forces assigned to an army group may consist of—
- (a) Field armies.
 - (b) Separate corps.
 - (c) Divisions.

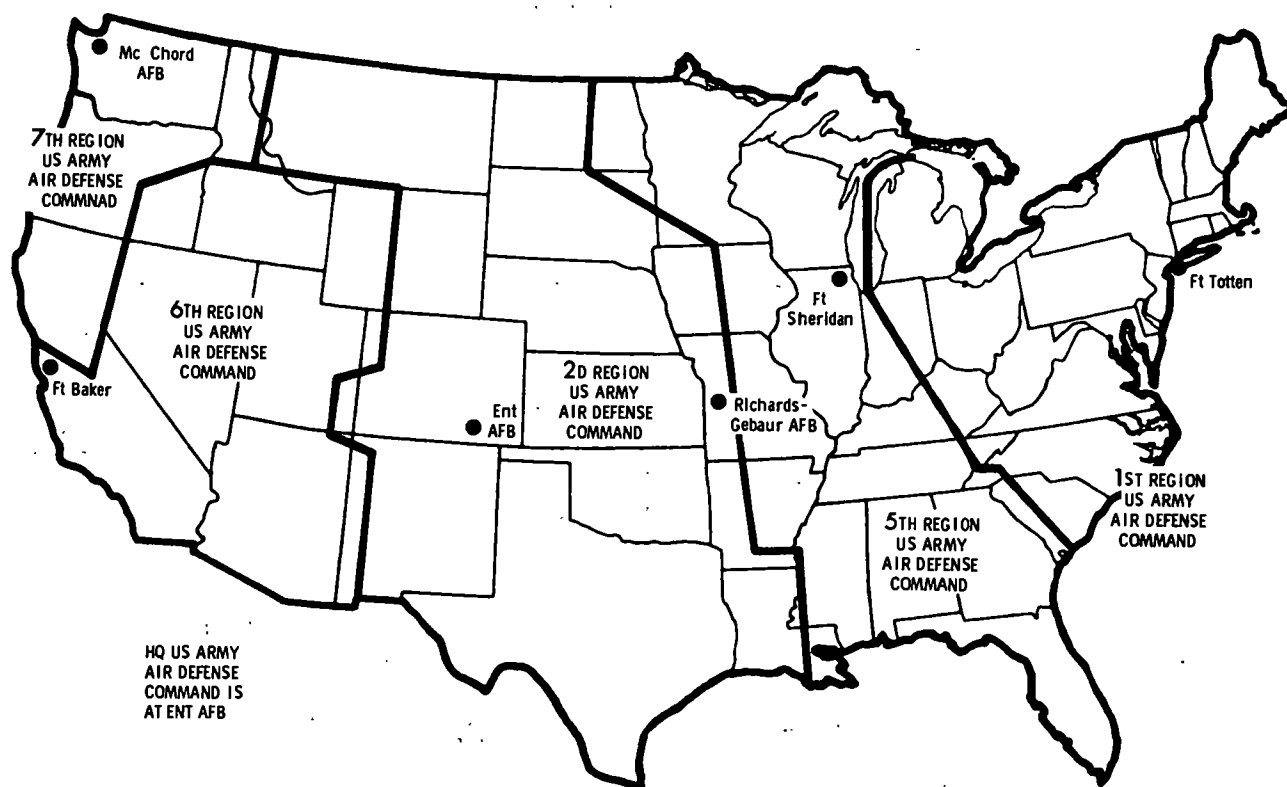


Figure 1-3

Section II. FIELD ARMY, CORPS, TASK FORCE, AND LOGISTICAL COMMAND

1-5. Field Army

a. General. The field army is a tactical and administrative organization capable of independent operations. Normally, it consists of a headquarters; certain assigned field army troops; and a variable number of corps, divisions, and reinforcing combat, combat support, and combat service support troops. The field army may also consist of unconventional warfare forces as the advancing field army's area of influence encompasses an unconventional warfare area (Guerrilla Warfare Operational Area—GWOA). For details see FM 31-21. For classified organizational data pertaining to the various types of units found in a field army, see FM 101-10-3, chapter 1.

b. Field Army Headquarters, TOE 51-1D (fig. 1-4).

c. Type Field Army Units (fig. 1-5). For composition of a type field army by branch, see paragraph 4-2.

1-6. Corps

a. General. When the corps operates as part of a field army, it is primarily a tactical organization of execution; however, when it operates as an independent corps, it exercises both tactical and administrative functions. The corps consists of a headquarters, certain assigned corps troops, and a variable number of divisions and reinforcing combat, combat support, and combat service support troops.

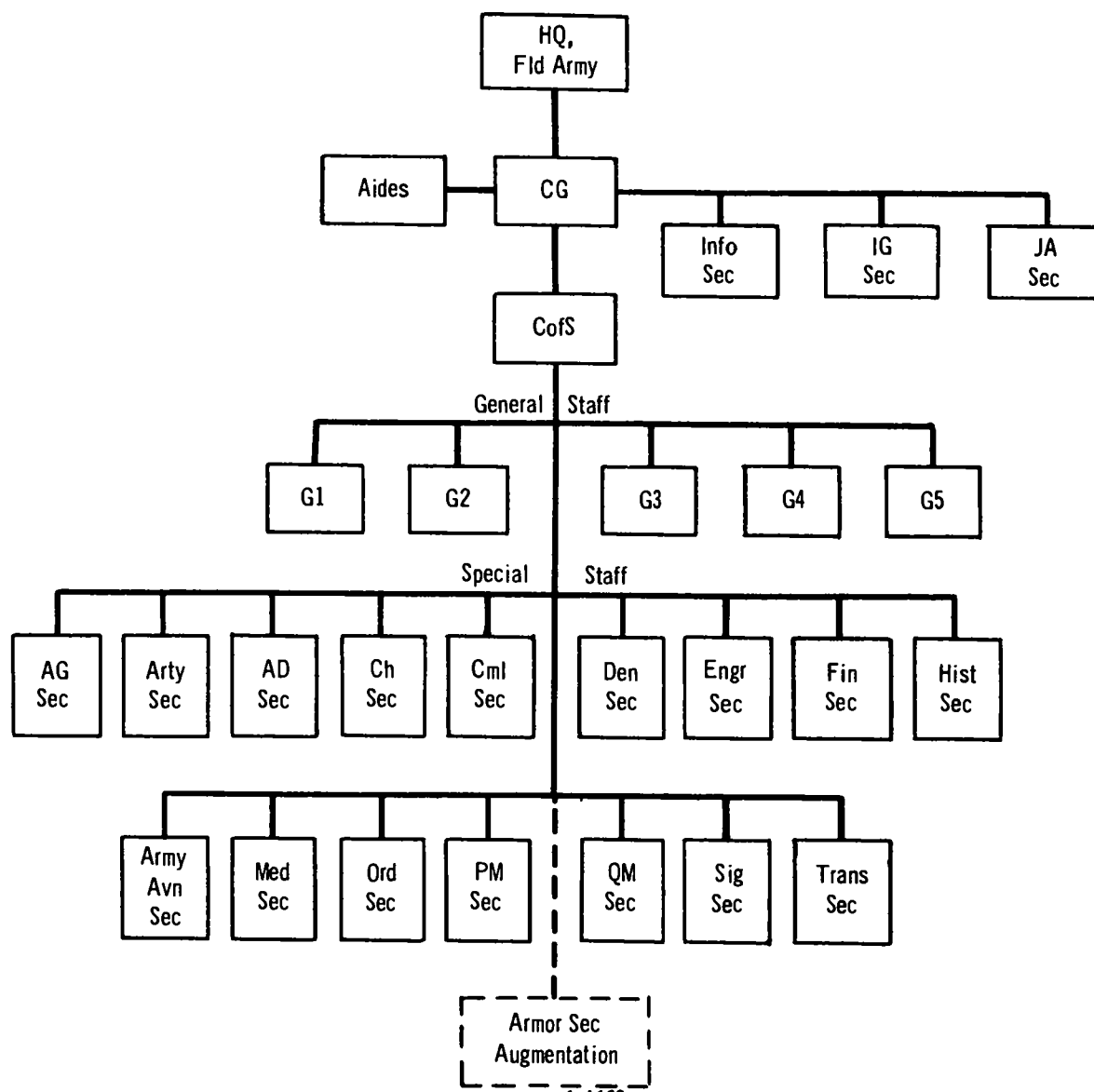


Figure 1-4

For classified organizational data pertaining to the various types of units found in a corps, see FM 101-10-3, chapter 1.

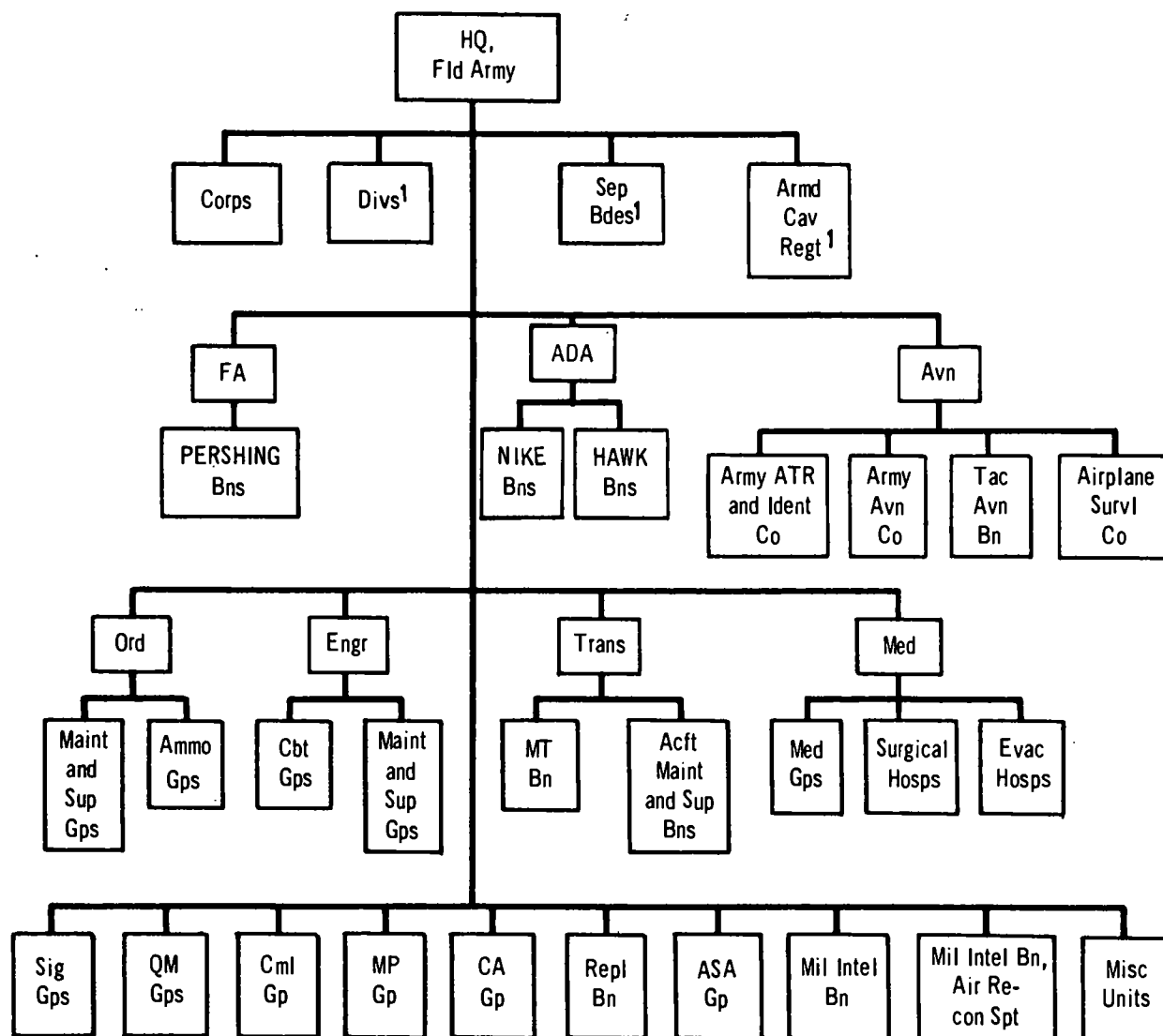
b. *Corps Headquarters, TOE 52-1D* (fig. 1-6).

c. *Type Corps Units* (fig. 1-7).

1-7. Task Force

A task force is a temporary grouping of units under one commander, formed for the

purpose of carrying out a specific operation or mission. A task force may be a uni-Service task force or a joint task force. If the task force is a joint task force, it will be composed of assigned or attached elements of the Army, the Navy or the Marine Corps, and the Air Force, or two or more of these Services, which is constituted and so designated by the Secretary of Defense or by the commander of a unified command, a specified command, or an existing joint task force. (See JCS Pub 2.)



¹ In most instances, combat units are assigned to field army, with attachment to corps.

Figure 1-5

1-8. Logistical Commands

a. General. A logistical command is a highly flexible organization consisting of a headquarters and headquarters element and a balanced force of combat service support units organized to execute a specific combat service support mission, augmented by tactical units if required for rear area security. Logistical commands normally operate in the communications zone, but may be assigned or attached

to a separate field army or an independent task force for the purpose of providing combat service support thereto.

b. Headquarters, Logistical Commands. The organization of these headquarters is flexible and should be tailored to fit the mission assigned. The staff organization is designed to fit the responsibilities of the command.

c. Combat Service Support Units. Combat service support units of the required numbers

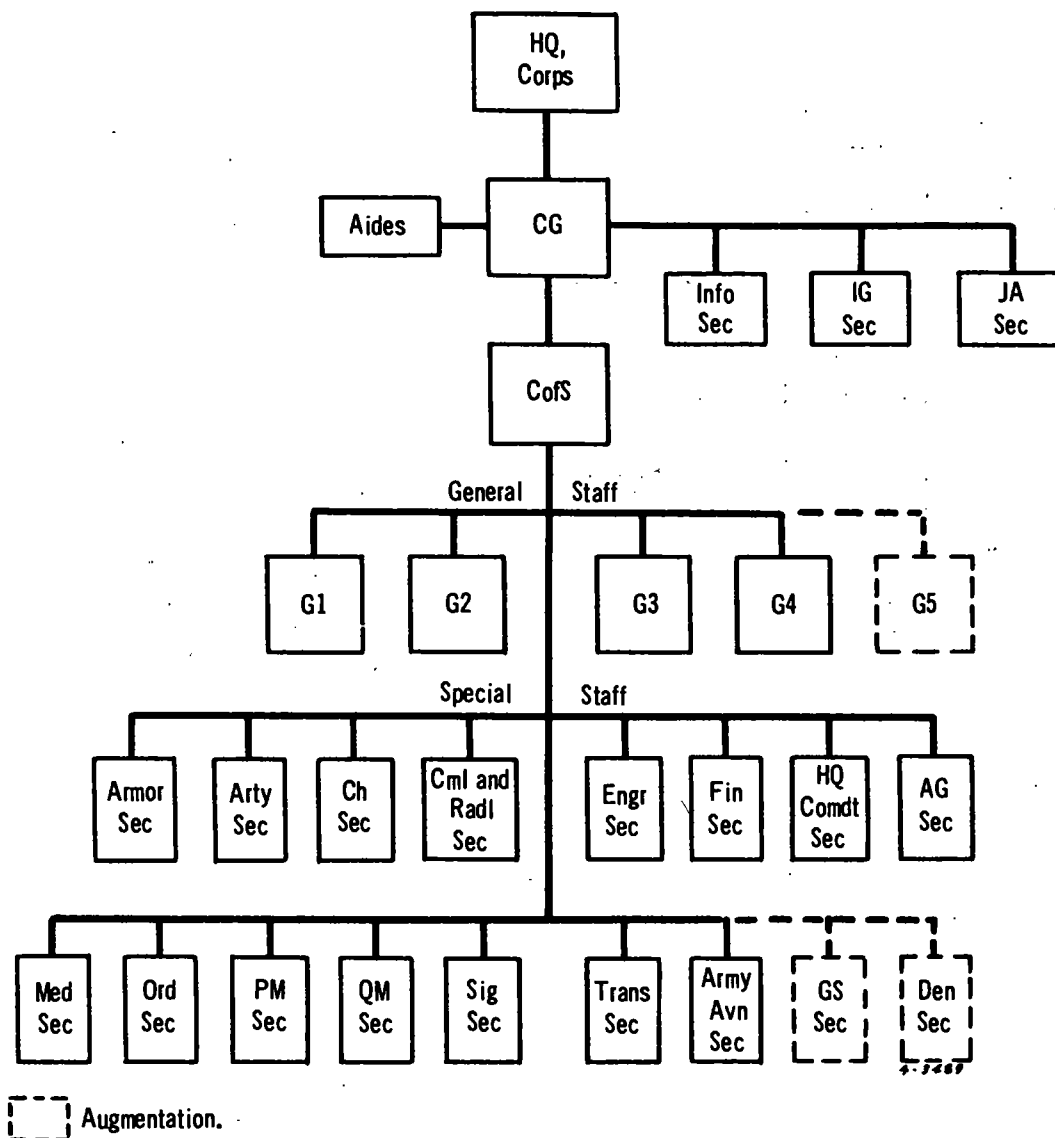


Figure 1-8

and types are assigned or attached as necessary to accomplish the assigned mission.

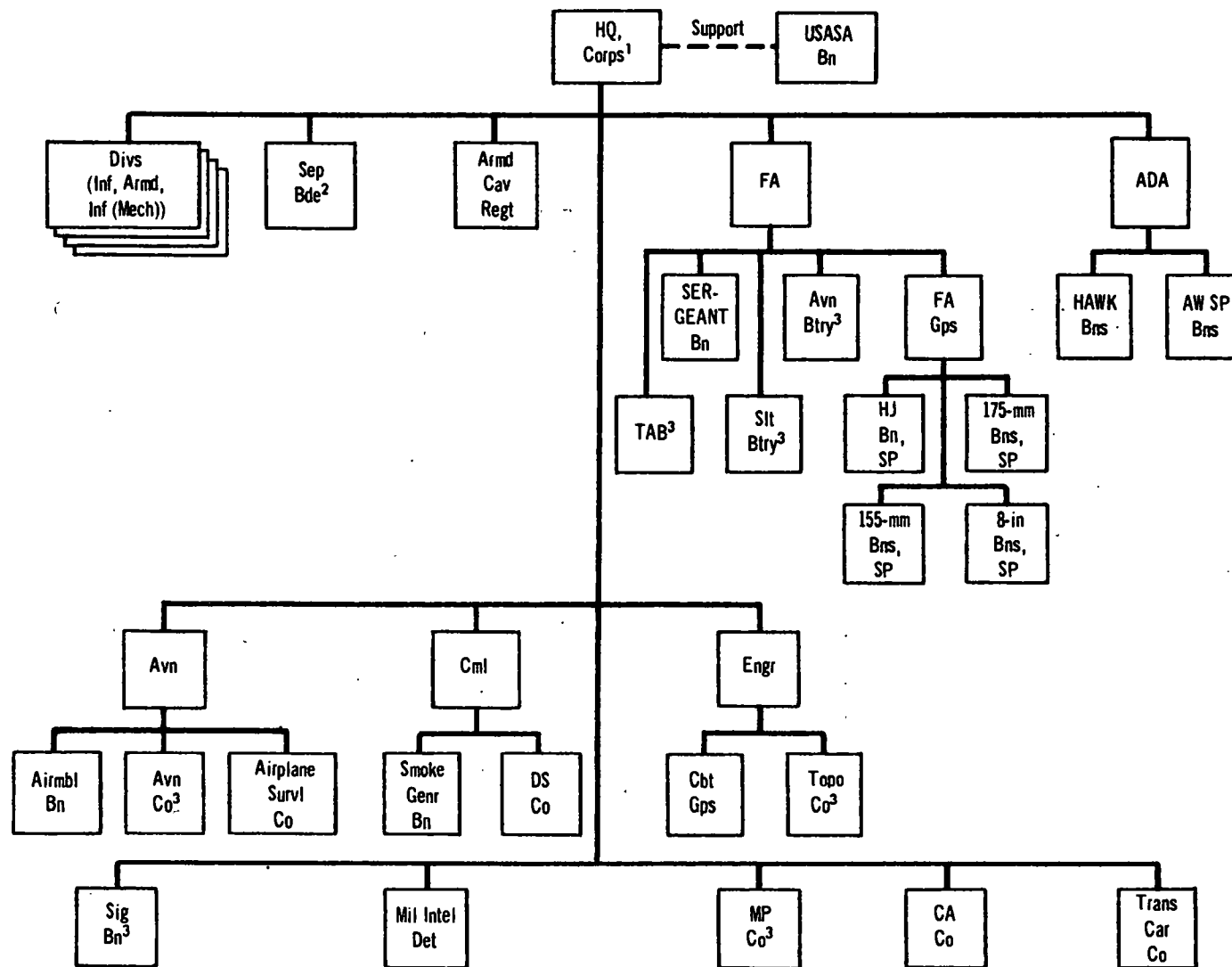
d. *TOE Type Headquarters.* At the present time, there are three types of TOE headquarters, logistical command (types A, B and C). These headquarters are available to provide nuclei for organizing logistical commands and are designed to command and control combat service support forces as indicated below.

- (1) *Logistical command type A (TOE 54-2).*

- (a) *Organization chart for headquarters and headquarters detachment, logistical command A (fig. 1-8).*

- (b) *Capabilities.*

1. Provides the organizational structure and a nucleus of a minimum number of trained combat service support personnel to provide the headquarters, logistical command, for—



¹Composition of corps will vary depending on mission, enemy capabilities, terrain, etc. Footnote 3 in the blocks above indicates units normally assigned to corps for control purposes; other units shown are attached as required.

²Infantry, tank, and infantry (mechanized) battalions attached in any combination.

³Normally assigned to corps.

Figure 1-7

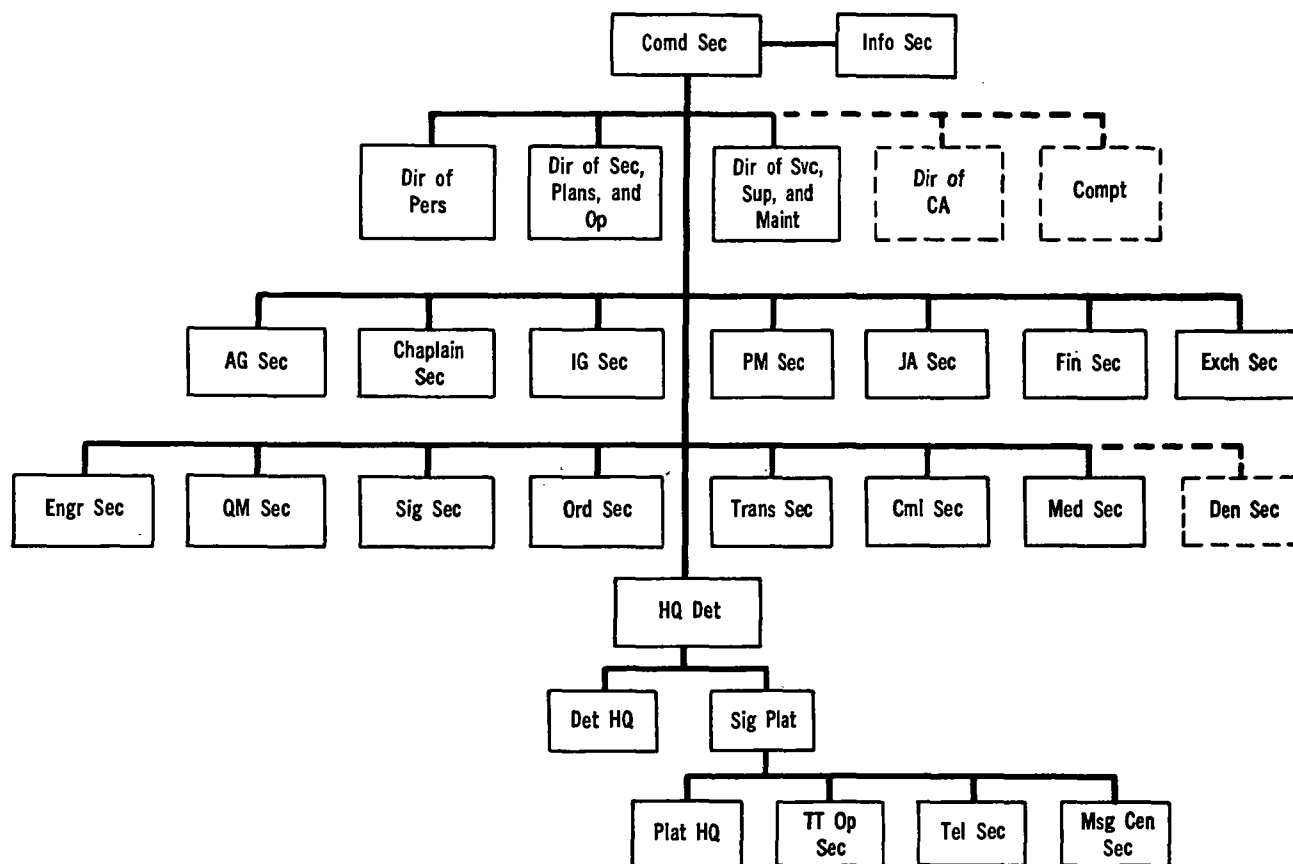


Figure 1-8

- (a) A base logistical command (BALOG).
 - (b) An advance logistical command (ADLOG).
 - (c) A logistical command in support of a major independent force of one reinforced division.
 - (d) Administration and rehabilitation of an area in which civil means are inadequate because of natural disaster or enemy action.
2. When augmentation of director of civil affairs (Off 1 EM 1), comptroller (Off 1 EM 5), and dental section (Off 1 EM 2) is authorized,

the director of civil affairs, comptroller, and dental surgeon provide staff supervision over civil affairs, comptroller activities, and dental activities, respectively.

3. Individuals of this unit, except chaplain and medical personnel, can fight as infantrymen when required. The unit has a limited capability of defending itself and its installations against hostile ground attack.

(c) *Strength.*

1. Headquarters and headquarters detachment, logistical command A: Off 59 WO 5 EM 128 Agg 192.

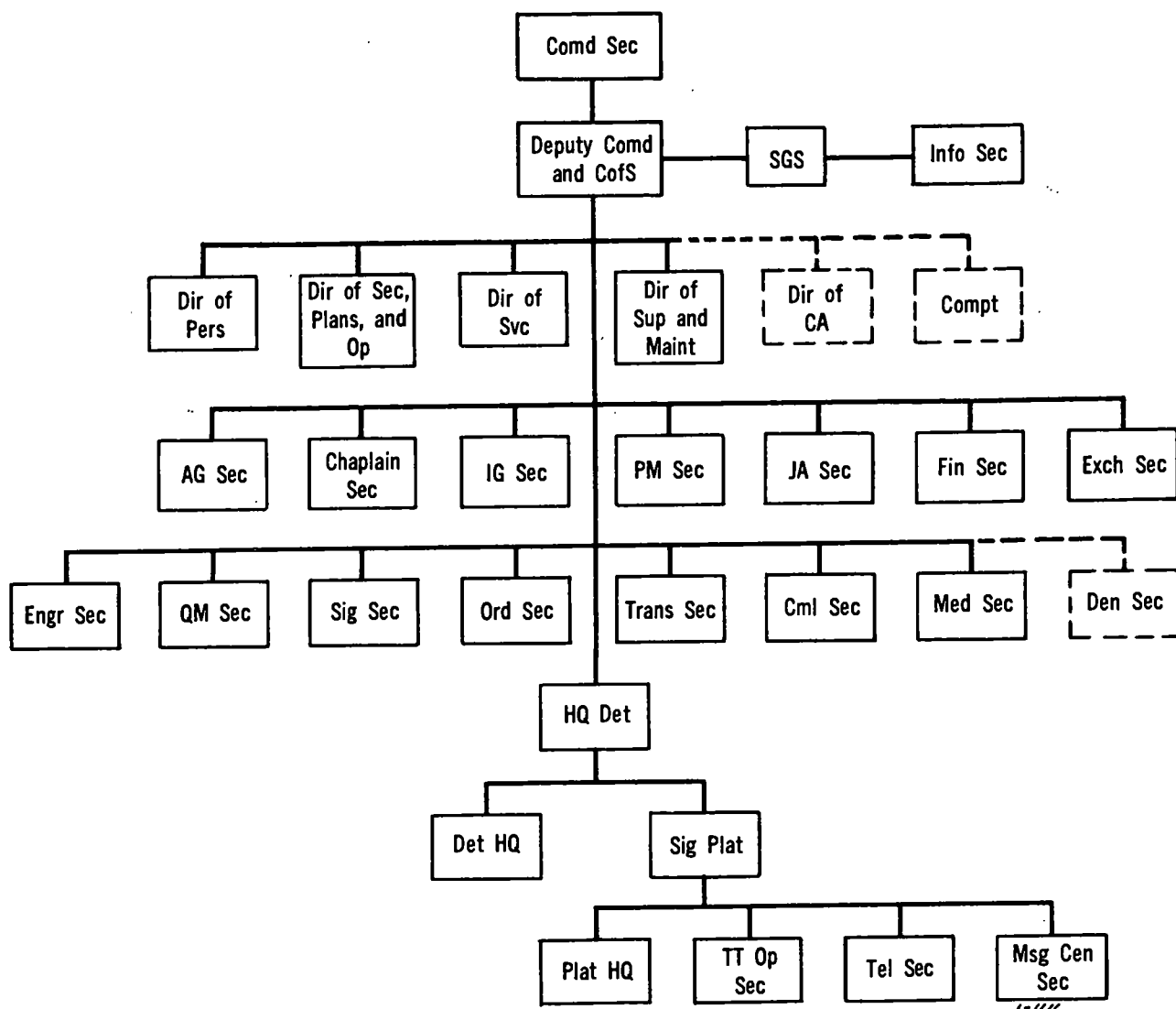


Figure 1-9

2. Logistical command A: Aggregate 192 plus assigned or attached combat service support forces (9,000 to 15,000).

(d) *Basis of allocation.* As required; normally 1 for the support of a force of approximately 30,000 troops.

(e) *Mobility.* Fixed.

(2) *Logistical command type B (TOE 54-102).*

(a) *Organization chart for headquarters and headquarters detachment, logistical command B (fig. 1-9).*

(b) *Capabilities.*

1. Provides the organizational structure and a nucleus of a minimum number of trained combat service support personnel to provide the headquarters, logistical command for—

(a) A base logistical command.

- (b) An advance logistical command.
 - (c) A logistical command in support of a major independent force of one corps.
 - (d) Administration and rehabilitation of an area in which civil means are inadequate because of natural disaster or enemy action.
2. When augmentation of director of civil affairs (Off 3 EM 2), comptroller (Off 3 WO 1 EM 6), and dental section (Off 1 EM 2) is authorized, the director of civil affairs, comptroller, and dental surgeon provide staff supervision over civil affairs, comptroller activities, and dental activities, respectively.
 3. Individuals of this unit, except chaplain and medical personnel, can fight as infantrymen when required. The unit has a limited capability of defending itself against hostile ground attack.
- (c) *Strength.*
 1. Headquarters and headquarters detachment logistical command B: Off 115 ANC 1 WO 12 EM 200 Agg 328.
 2. Logistical command B: Aggregate 328 plus assigned or attached service forces (35,000 to 60,000).
 - (d) *Basis of allocation.* As required; normally 1 for the support of a force of approximately 100,000 troops.
 - (e) *Mobility.* Fixed.
- (3) *Logistical command type C (TOE 54-202).*
 - (a) *Organization chart for headquarters and headquarters company, logistical command C (fig. 1-10).*
 - (b) *Capabilities.*
 1. Provides the organizational structure and a nucleus of a minimum

number of trained combat service support personnel to provide the headquarters, logistical command, for—

- (a) Theater army logistical command.
 - (b) A base logistical command.
 - (c) An advance logistical command.
 - (d) A logistical command in support of a major independent force of four or more divisions.
 - (e) Administration and rehabilitation of an area in which civil means are inadequate because of natural disaster or enemy action.
2. When augmentation of comptroller (Off 4 WO 1 EM 9) and dental section (Off 2 EM 2) is authorized, the comptroller and the dental surgeon will provide supervision over comptroller and dental activities, respectively.
 3. Individuals of this unit, except chaplain and medical personnel, can fight as infantrymen when required. The unit has a limited capability of defending itself against hostile ground attack.
- (c) *Strength.*
 1. Headquarters and headquarters company, logistical command C: Off 170 ANC 1 WO 18 EM 319 Agg 508.
 2. Logistical command C: Aggregate 508 plus assigned or attached service forces (75,000 to 150,000).
 - (d) *Basis of allocation.* As required; normally one for the theater army logistical command and one for each advance logistical command and each base logistical command.
 - (e) *Mobility.* Fixed.

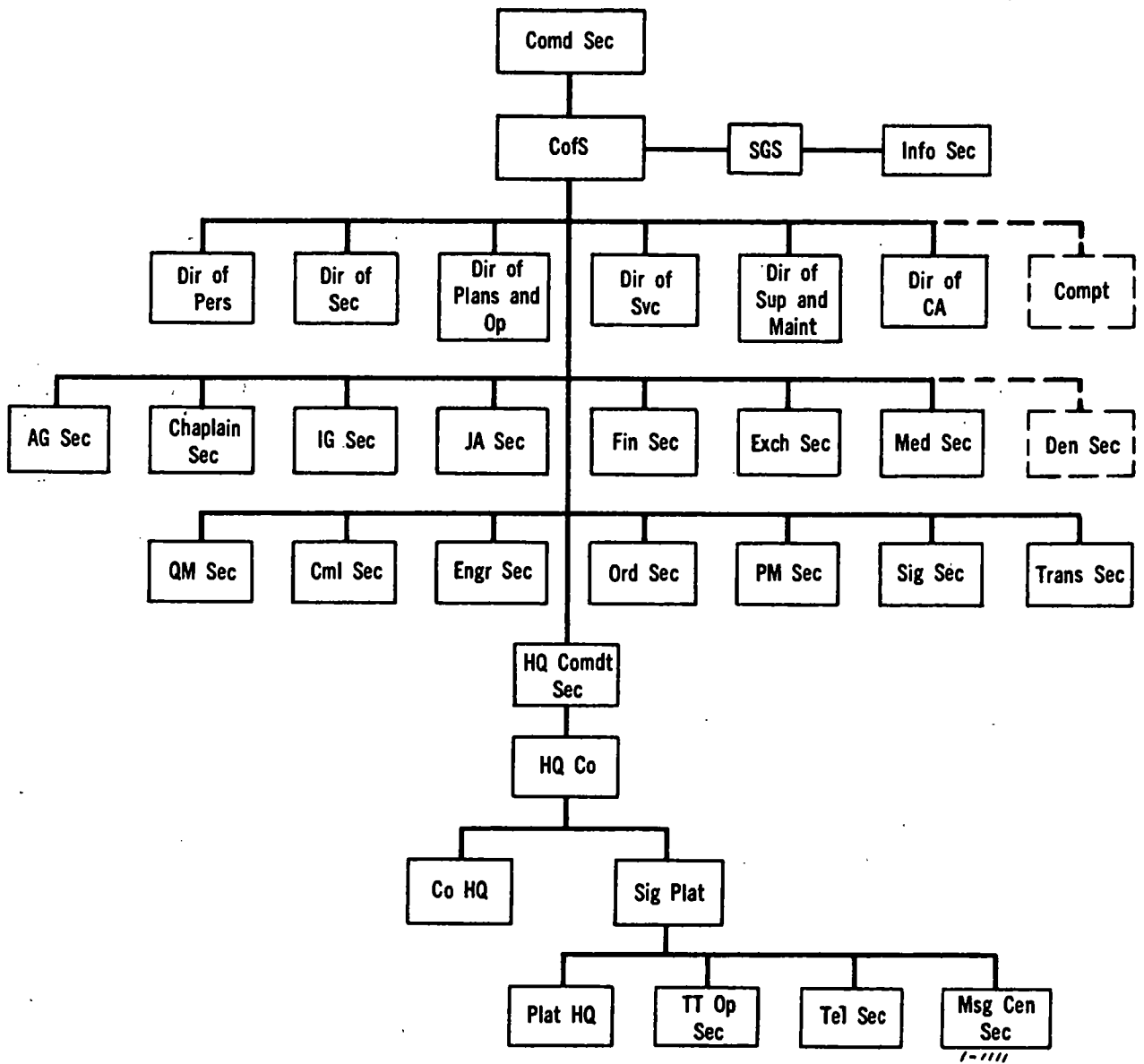
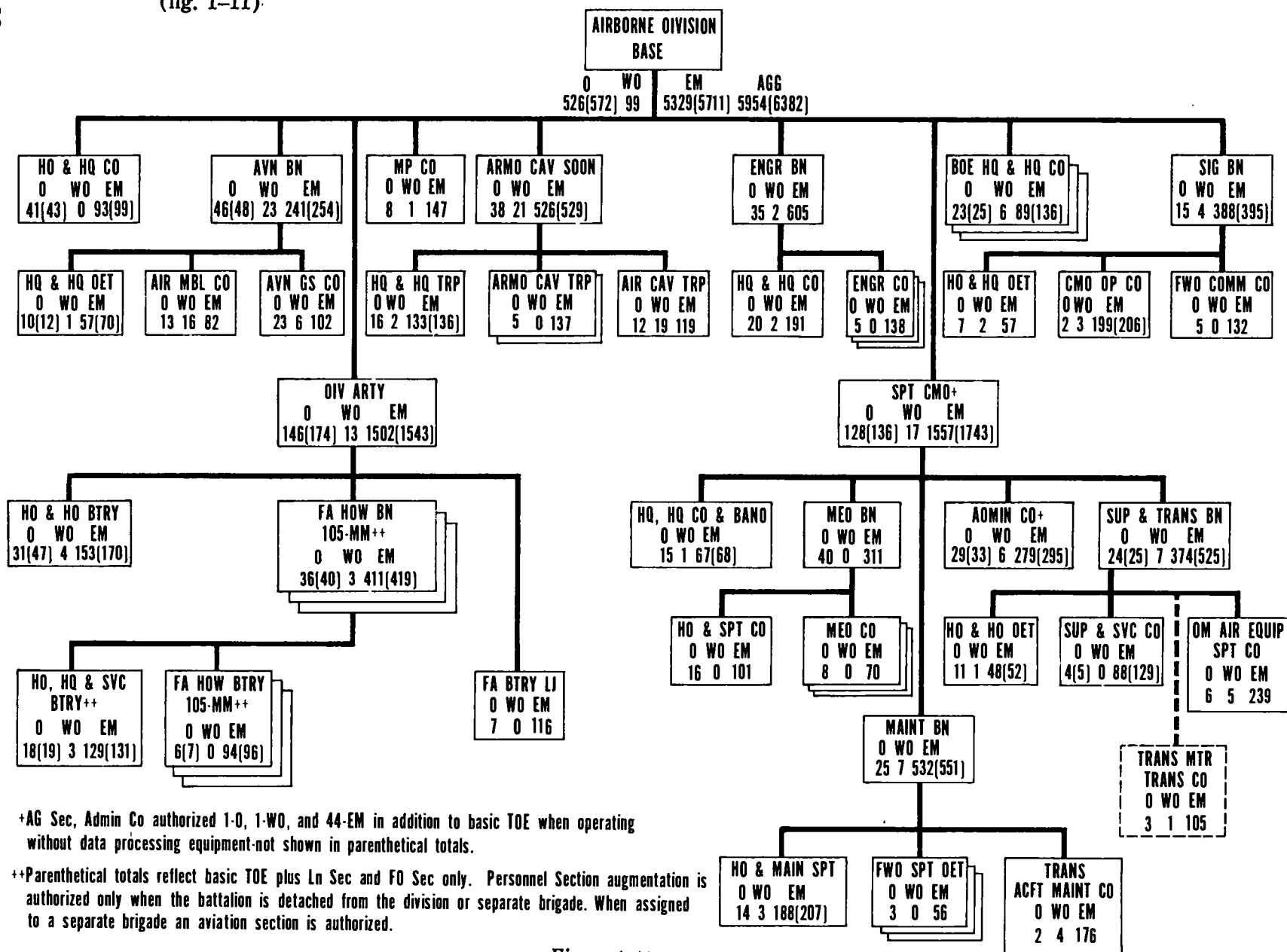


Figure 1-10

1-9. Airborne Division Base (fig. 1-11).

Section III. AIRBORNE DIVISION



+AG Sec, Admin Co authorized 1-O, 1-WO, and 44-EM in addition to basic TOE when operating without data processing equipment-not shown in parenthetical totals.

+Parenthetical totals reflect basic TOE plus Ln Sec and FO Sec only. Personnel Section augmentation is authorized only when the battalion is detached from the division or separate brigade. When assigned to a separate brigade an aviation section is authorized.

Figure 1-11

1-10. Airborne Division Base—Weapons (TOE 57E)

		1	2	3	4	5	6	7	8	9	10
	Item	Div hq & hq co	Avn bn	(3) Bde hq & hq co	SIG bn	MP co	Arm'd cav sqdn	Engr bn	Div arty	Spt cmd	Total div
	WEAPONS										
1	Bipod rifle 7.62-mm.....			(18)		22	20	13		4 (12)	59 (85)
2	Gun, machine cal .50 hb flex.....	2		6			18			(4)	26 (30)
3	Gun, machine 7.62-mm lightweight gp.....			(6)	5	6	36	47	72 (74)	41 (43)	207 (217)
4	Gun, submachine cal .45.....						24				24
5	Launcher, rocket 318-mm XM34.....								4		4
6	Launcher, grenade 40-mm.....			9 (27)	14	13	59	67	89		251 (269)
7	Launcher, rocket 3.5-inch.....			12	9			48	85 (87)	14 (16)	168 (172)
8	Launcher, rocket multiple 115-mm.....								9		9
9	Mortar, 81-mm on mount.....						6				6
10	Pistol, automatic cal .45.....	27 (29)	79	78 (120)	24	43	200	117	177 (192)	67 (68)	812 (872)
11	Rifle, 90-mm.....					4					4
12	Rifle, 106-mm on mount.....						12				12
13	Rifle, 7.62-mm semiautomatic lb.....	107 (119)	230 (245)	264 (369)	383 (390)	111	385 (388)	502	1483 (1534)	1632 (1825)	5091 (5378)
14	Armt subsys SS-11.....		3				4				7
15	Armt, subsys 2.75-inch rocket XM3.....		3				4				7
16	Armt, subsys 7.62-mm mg quad XM6.....		13				9				22
17	Armt, subsys 7.62-mm mg twin XM2.....		10	18			9		10		47
18	Howitzer, lt towed 105-mm XM102.....								54		54

Note. Parenthetical totals reflect basic TOE plus augmentation.

1-11. Airborne Division Base—Vehicles and Vehicular Equipment (TOE 57E)

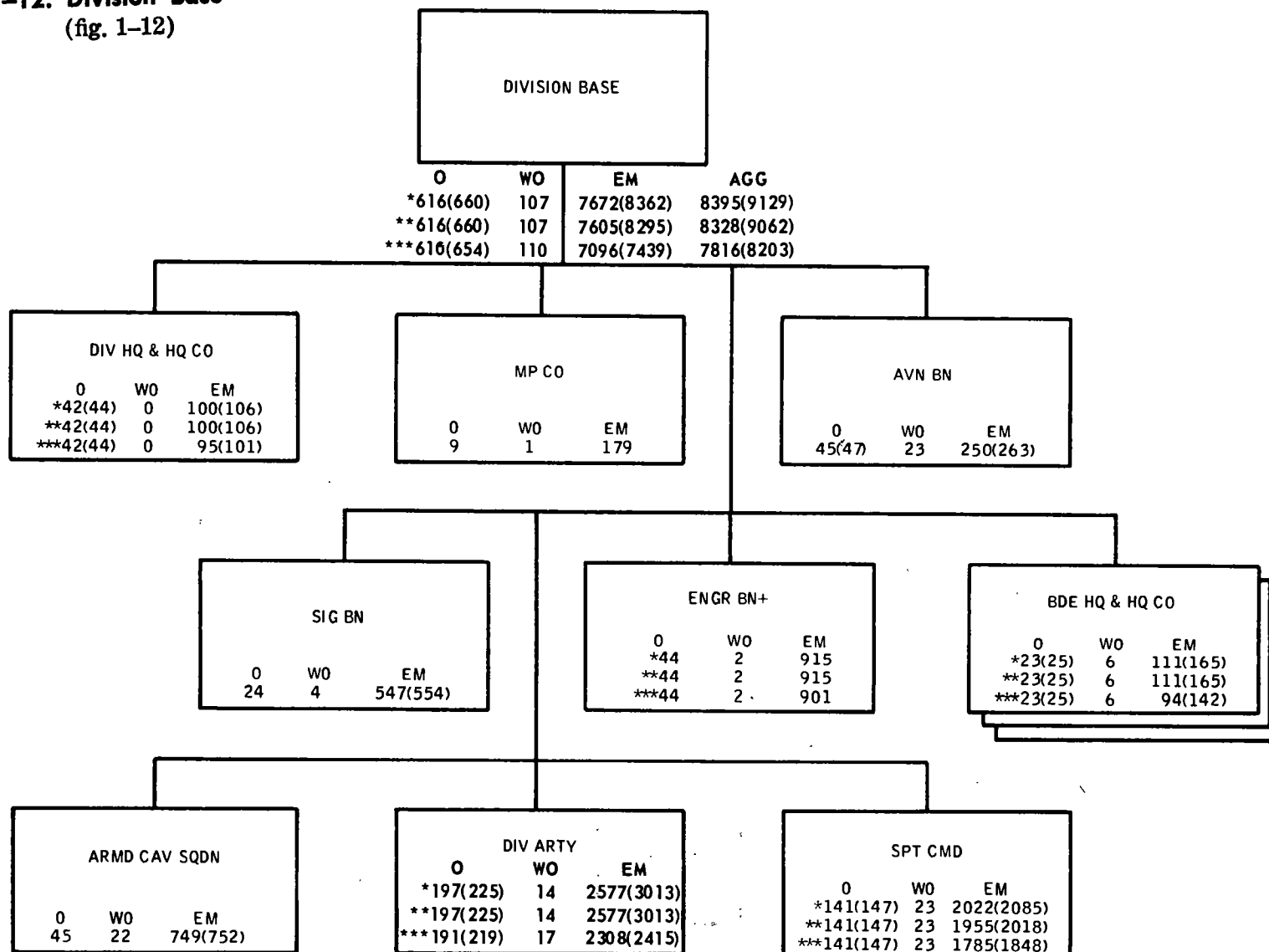
		1	2	3	4	5	6	7	8	9	10
	Item	Div hq & hq co	Avn bn	(3) Bde hq & hq co	SIG bn	MP co	Armd cav sqdn	Engr bn	Div arty	Spt cmd	Total div
	VEHICLES AND VEHICULAR EQUIP										
1	Carrier lt wpn inf 1½-ton 4 x 4.....			12				27		7	46
2	Cart rkt trns 318-mm/LJ.....								8		8
3	Chassis tlr gen 2½-ton 2-wheel.....								4		4
4	Handling unit 318-mm rkt trk mtd.....								4		4
5	Launcher rkt 318-mm XM34.....								4		4
6	Launcher rkt multiple 115-mm.....								9		9
7	Repair shop sig corps trk mtd w-½- ton 6 x 6.....									2	2
8	Stlr lb wrecker 12-ton 4-wheel 40 ft.....									1	1
9	Stlr stake 6-ton 2-wheel.....									2	2
10	Stlr van expan 6-ton 4-wheel.....									4	4
11	Stlr van shop 6-ton 2-wheel.....									2	2
12	Tlr ammo 1½-ton 2-wheel.....						2		12		14
13	Tlr amph cargo ¼-ton 2-wheel.....	16 (17)	8 (9)	39	26	15	12	27	86 (98)	55 (60)	284 (303)
14	Tlr cargo ¾-ton 2-wheel.....	12	12 (13)	18 (21)	30 (31)	4	10 (11)	21	120 (122)	38 (53)	265 (288)
15	Tlr cargo 1½-ton 2-wheel.....	4	16	3		1	7	12	13	77 (121)	133 (167)
16	Tlr tank water 1½-ton 2-wheel.....	1	3	3	2	1	4	4	14	15 (17)	47 (49)
17	Truck amb fld ¾-ton 4 x 4.....	2	1						4	40	47
18	Truck amb front line ¼-ton 4 x 4.....						6	1			7
19	Truck cargo ¾-ton 4 x 4.....	12 (13)	19	12 (15)	68 (70)	4	24 (25)	22	88 (90)	50 (66)	299 (312)
20	Truck cargo ¾-ton 4 x 4 w/wn.....		1 (2)	6			8		105	6	126 (127)
21	Truck cargo 2½-ton 6 x 6 lwb.....	4	9	3	4	1	14	2	18	68 (106)	123 (161)
22	Truck cargo 2½-ton 6 x 6 lwb w/wn.....	1	6	3		1	10	10	30	32 (40)	93 (101)
23	Truck cargo 2½-ton 6 x 6 xlwb.....									1	1
24	Truck dump 2½-ton 6 x 6.....							5			5
25	Truck dump 2½-ton 6 x 6 w/wn.....							54			54
26	Truck dump 5-ton 6 x 6 w/wn.....							5			5
27	Truck tank fuel servicing 2½-ton 6 x 6.....		10	3			7	1		(5)	22 (26)
28	Truck tractor 2½-ton 6 x 6 lwb w/wn.....									4	4
29	Truck tractor 5-ton 6 x 6 swb.....									2	2
30	Truck tractor wrecker 5-ton 6 x 6 xlwb w/wn.....									1	1
31	Truck utility ¼-ton 4 x 4.....	22 (24)	12 (13)	69	28	25	71	27	133 (146)	60 (65)	447 (468)
32	Truck van shop 2½-ton 6 x 6.....		5					1	5	8 (9)	19 (20)
33	Truck van shop 2½-ton 6 x 6 w/wn.....									7	7
34	Truck wrecker crane 2½-ton 6 x 6 w/wn.....									1	1

35	Truck wrecker lt 2½-ton 6 x 6 w/wn	1	3			1	1	3	10(12)	19(21)
36	Tractor whl whse gas pneum 4000 lb								4	4
37	Trailer platform whse wood 6000 lb								30	30
38	Truck lift fork gas 6000-lb rough terrain								7	7
39	Truck lift fork gas 15,000 lb								3	3
40	Howitzer lt towed 105-mm M102							54		54

Note. Parenthetical totals reflect basic TOE plus augmentation.

1-12. Division Base (fig. 1-12)

Section IV. ARMORED, MECHANIZED, AND INFANTRY DIVISION



*Unit totals when organic to Armd Div.

**Unit totals when organic to Mech Div.

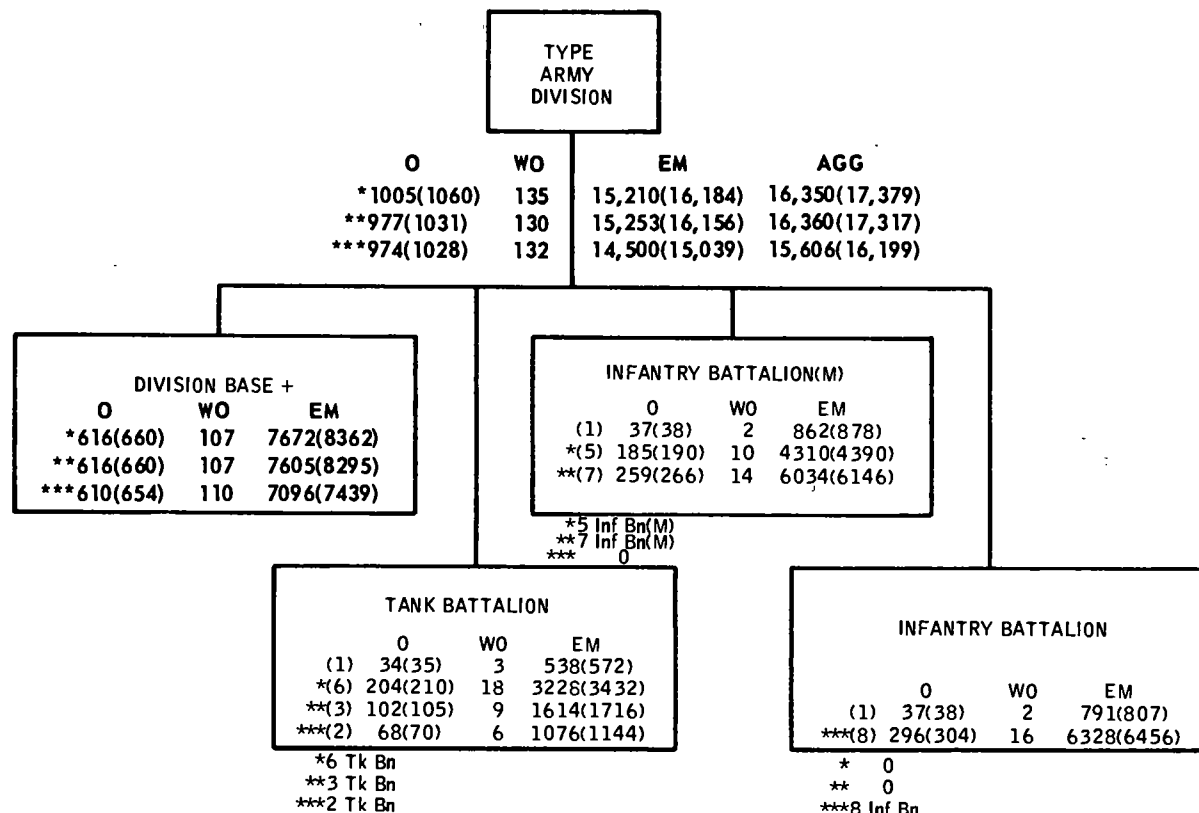
***Unit totals when organic to Inf Div.

+Unit totals are for battalion when equipped with M4T6 or class 60 bridging--with MAB there are 5 less EM.

Note. Parenthetical totals reflect basic TOE plus augmentation.

Figure 1-12

1-13. Type Army Division (fig. 1-13)



*Unit totals when organic to Armd Div.
 **Unit totals when organic to Mech Div.
 ***Unit totals when organic to Inf Div.
 +Unit totals include Engr Bn when equipped with M4T6 or class 60 bridging - with MAB there are 5 less EM.

Note. Parenthetical totals reflect basic TOE plus augmentation.

Figure 1-13

1-14. Summary of Division's Equipment-Weapons

	Item	DIVISION BASE			TYPE DIVISION		
		ARMD 17 E	MECH 37 E	INF 7 E	ARMD Div base 6 tk bn 5 (M) inf bn	MECH Div base 8 tk bn 7 (M) inf bn	INF Div base 2 tk bn 8 inf bn
1	Bipod rifle 7.62-mm	168(186)	168(186)	168(186)	460(478)	566(584)	620(638)
2	ENTAC-1				15	21	24
3	Gun machine cal .50 lb flex	53(57)	53(57)	53(57)	305(309)	277(281)	201(205)
4	Gun machine cal .50 lb OEM	251(263)	251(263)	116	1139(1175)	1046(1070)	278(286)
5	Gun machine cal .30 lb OEM	18	18	18	40	38	22
6	Gun machine 7.62-mm lightweight GP	256(305)	257(306)	275(297)	556(605)	650(699)	485(507)
7	Gun machine 7.62-mm OEM	70	70	54	474	317	172
8	Gun submachine cal .45	53	53	47	867	523	295
9	Gun demolition 165-mm OEM	8	8	4	8	8	4
10	Gun tank 76-mm OEM	18	18	18	40	38	22
11	Gun tank 105-mm OEM				324	162	108
12	Howitzer (sp or towed) 8-inch OEM	4	4	4	4	4	4
13	Howitzer (sp or towed) 155-mm OEM	72	72	18	72	72	18
14	Howitzer (sp or towed) 105-mm OEM			54			54
15	Launcher 762-mm rocket	4	4	4	4	4	4
16	Launcher grenade 40-mm	365(425)	365(425)	323(353)	900(996)	1033(1111)	1033(1075)
17	Launcher rocket 3.5-inch	247(288)	247(288)	275(298)	342(383)	380(421)	411(434)
18	Launcher rocket multiple 115-mm	9	9	9	9	9	9
19	Mortar (sp or on mount) 4.2-inch OEM	9	9	9	53	49	49
20	Mortar (sp or on mount) 81-mm OEM				45	63	72
21	Pistol automatic cal .45	1245(1346)	1242(1343)	1143(2117)	4508(4678)	4039(4188)	3711(3827)
22	Rifle 90-mm	9(15)	9(15)	9(15)	99(105)	135(141)	153(159)
23	Rifle 106-mm on mount				30	42	64
24	Rifle 7.62-mm semi- automatic lb	7228(7628)	7163(7563)	6780(7099)	11,926(12,541) *	12,401(12,967) *	12,004(12,477) *
25	Gun recoilless 120-mm XM63				(10)	(14)	(16)
26	Gun recoilless 155-mm XM64				(10)	(14)	(16)
27	Armt subsys cal .30 mg twin XM1	27	27	27	27	27	27
28	Armt subsys SS-11	7	7	7	7	7	7
29	Armt subsys 2.75-inch rocket XM3	19	19	19	19	19	19
30	Armt subsys 7.62-mm mg quad XM6	22	22	22	22	22	22
31	Armt subsys 7.62-mm mg twin XM2	16	16	16	16	16	16

Notes. 1. * These totals are decreased by 5 when equipped with MAB.

2. Parenthetical totals reflect basic TOE plus augmentation.

1-15. Summary of Division's Equipment—Vehicles and Vehicular Equipment

	Item	DIVISION BASE			TYPE DIVISION		
		ARMD 17-E	MECH 37 E	INF 7 E	ARMD Div base 6 tk bn 5 (M) inf bn	MECH Div base 3 tk bn 7 (M) inf bn	INF Div base 2 tk bn 8 inf bn
1	Airplane observation medium.....	4(6)	4(6)	4(6)	4(6)	4(6)	4(6)
2	Boat bridge erection inboard eng 27 ft lg.....	8 ^a	8 ^a	8 ^a	8 ^a	8 ^a	8 ^a
3	Bridge avl scissoring C1 60 60 ft lg.....	6	6	6	18	12	10
4	Bridge floating MAB 36 ft lg.....	16 ^b	16 ^b	16 ^b	16 ^b	16 ^b	16 ^b
5	Bulldozer earthmoving tank mounting.....				18	9	6
6	Carrier cargo XM548.....	58	58		58	58	
7	Carrier CP lt track.....	66(69)	66(69)	6	143(146)	136(139)	20
8	Carrier personnel full-track.....	66(78)	66(78)	25	378(414)	438(462)	49(57)
9	Carrier personnel full-track armored T114.....	62	62	50	142	147	60
10	Chassis trailer GP 3½-ton 2-wheel.....	1	1	1	1	1	1
11	Chassis trailer generator 2½-ton 2-wheel.....	4	4	4	4	4	4
12	Combat engr vehicle full-track.....	8	8	4	8	8	4
13	Crane shovel wheel mtd 20-ton rough terrain.....	3	3	3	3	3	3
14	Firefighting equip set trk mtd Army acft crash.....	2	2	2	2	2	2
15	Flamethrower portable.....	(3)	(3)	(3)	45(48)	63(66)	72(75)
16	Grader road mtd hv 6 x 4.....	4	4	4	4	4	4
17	Guidance & launching station entac 1.....				15	21	24
18	Handling unit 762-mm rkt tlr mtd.....	8	8	8	8	8	8
19	Heating and tiedown unit 762-mm rkt truck mtd.....	8	8	8	8	8	8
20	Helicopter observation.....	47	47	47	47	47	47
21	Helicopter utility.....	19	19	19	19	19	19
22	Helicopter utility tactical transport.....	31	31	31	31	31	31
23	Howitzer (sp full-track or towed) 8-inch.....	4	4	4	4	4	4
24	Howitzer (sp full-track or towed) 155-mm.....	72	72	18	72	72	18
25	Howitzer (sp full-track or towed) 105-mm.....			54			54
26	Launcher 762-mm rkt trk mtd.....	4	4	4	4	4	4
27	Launcher rocket multiple 115-mm.....	9	9	9	9	9	9
28	Launcher tank chassis for avlb.....	4	4	4	16	10	8
29	Loader scoop dsl 4-wheel.....	13	13	13	13	13	13
30	Lub and svc unit power oper tlr mtd.....	2	2	2	2	2	2
31	Mortar sp full-track 4.2-inch.....	9	9	9	53	49	17
32	Mortar sp full-track 81-mm T257E1.....				45	63	
33	Pneumatic tool and camp unit tlr mtd.....	7 ^c	7 ^c	7 ^c	7 ^c	7 ^c	7 ^c
34	Ramp load vehicle MAB 39 ft 4 in lg.....	8 ^b	8 ^b	8 ^b	8 ^b	8 ^b	8 ^b
35	Recovery vehicle full-track lt armd T120E1.....	12	12	5	43	50	7
36	Repair shop sig corps trk mtd 2½-ton 6 x 6.....	19	19	19	19	19	19
37	Shop equip orgn rep lt trk mtd.....	2	2	2	2	2	2
38	Shop equip contact maint trk mtd.....	2	2	2	2	2	2
39	Stlr lb 25-ton 4-wheel.....	10	10	14	10	10	14
40	Stlr lb 60-ton 8-wheel.....	1	1	1	1	1	1
41	Stlr lb wrecker 12-ton 4-wheel 40-ft.....	1	1	1	1	1	1
42	Stlr repair parts van 6-ton.....	1	1	1	1	1	1
43	Stlr stake 12-ton 4-wheel.....	32	32	30	32	32	30
44	Stlr tank fuel servicing 5000-gal 4-wheel.....	20	20	10	20	20	10
45	Stlr tank transporter 50-ton 8-wheel.....	6	6	2	6	6	2
46	Stlr van cargo 6-ton 2-wheel.....	9	9	9	9	9	9
47	Stlr van expansible 6-ton 4-wheel.....	4	4	4	4	4	4
48	Stlr van supply 12-ton 4-wheel.....	3	3	3	3	3	3
49	Tank cbt full-track lt gun.....	18	18	18	40	38	22

See footnotes at end of table.

	Item	DIVISION BASE			TYPE DIVISION		
		ARMD 17-E	MECH 37 E	INF 7 E	ARMD Div base 6 tk bn 5 (M) inf bn	MECH Div base 8 tk bn 7 (M) inf bn	INF Div base 2 tk bn 8 inf bn
50	Tank cbt full-track mdm gun.....				324	162	108
51	Tank recovery vehicle medium.....	7	7	5	37	22	15
52	Tractor full-track low spd w/angledozer.....	8	8	12	8	8	12
53	Trailer ammo 1½-ton 2-wheel.....	99	99	78	119	127	78
54	Trailer amphibious cargo ¼-ton 2-wheel.....	343 (356)	341 (354)	362 (375)	554 (568)	563 (586)	664 (687)
55	Trailer basic utility 2½-ton.....	10 ^d	10 ^d	10 ^d	10 ^d	10 ^d	10 ^d
56	Trailer cable reel.....	2	2	2	2	2	2
57	Trailer cargo ¾-ton 2-wheel.....	268 (293)	268 (293)	306 (334)	352 (382)	364 (396)	594 (630)
58	Trailer cargo 1½-ton 2-wheel.....	428 (456) ^b	425 (453) ^b	400 (410) ^b	621 (649) ^b	598 (626) ^b	564 (574) ^b
59	Trailer flatbed 10-ton.....	1	1	1	1	1	1
60	Trailer tank water 1½-ton 2-wheel.....	65 (66)	65 (66)	62 (63)	109 (110)	105 (106)	102 (103)
61	Truck ambulance field ¾-ton 4 x 4.....	57	57	57	57	57	57
62	Truck ambulance front line ¼-ton 4 x 4.....	4	4	4	37	34	55
63	Truck cargo ¾-ton 4 x 4.....	305 (362)	305 (362)	329 (368)	367 (439)	381 (459)	629 (692)
64	Truck cargo ¾-ton 4 x 4 w/wn.....	93 (94)	93 (94)	93 (94)	154 (155)	146 (147)	121 (122)
65	Truck cargo 2½-ton 6 x 6 LWB.....	324 (335)	321 (332)	305 (316)	385 (396)	374 (385)	389 (400)
66	Truck cargo 2½-ton 6 x 5 LWB w/wn.....	234 (235) ^c	234 (235) ^c	338 (339) ^c	320 (321) ^c	295 (296) ^c	432 (433) ^c
67	Truck cargo 2-12-ton 6 x 6 XLWB.....	1	1	1	1	1	1
68	Truck cargo 5-ton 6 x 6 LWB.....	11	11	11	119	92	37
69	Truck cargo 5-ton 6 x 6 LWB w/wn.....	117	117	59	199	194	89
70	Truck cargo 10-ton 6 x 6 w/wn.....			4			4
71	Truck dump 5-ton 6 x 6 w/wn.....	22	22	58	22	22	58
72	Truck lift fork gas pt 6000 lb cap rough ter- rain 144 lh.....	3	3	3	3	3	3
73	Truck stake 5-ton brg trans.....	54 ^a	54 ^a	54 ^a	54 ^a	54 ^a	54 ^a
74	Truck tank fuel servicing 2½-ton 6 x 6.....	28	28	28	34	31	30
75	Truck tank fuel servicing 2½-ton 6 x 6 w/wn.....	2	2	2	2	2	2
76	Truck tractor 2½-ton 6 x 6 LWB w/wn.....	1	1	1	1	1	1
77	Truck tractor 2½-ton 6 x 6 SWB.....	9	9	9	9	9	9
78	Truck tractor 5-ton 6 x 6 SWB.....	48	48	36	48	48	36
79	Truck tractor 5-ton 6 x 6 SWB w/wn.....	1	1	1	1	1	1
80	Truck tractor 10-ton 6 x 6 w/single midship wn low mtd 5th wheel.....	11	11	15	11	11	15
81	Truck tractor 10-ton 6 x 6 w/duel midship wns high mtd 5th wheel.....	6	6	2	6	6	2
82	Truck tractor wrecker 5-ton 6 x 6 XLWB w/wn.....	1	1	1	1	1	1
83	Truck utility ¼-ton 4 x 4.....	444 (460)	445 (461)	465 (481)	759 (791)	724 (757)	853 (887)
84	Truck utility ¼-ton 4 x 4 carrier for 106-mm rifle.....				30	42	64
85	Truck utility ¼-ton 4 x 4 carrier M38A10 carrier for DC.....				(10)	(14)	(16)
86	Truck van expansible 2½-ton 6 x 6.....	4	4	4	4	4	4
87	Truck van shop 2½-ton 6 x 6.....	52	51	57	62	65	65
88	Truck van shop 2½-ton 6 x 6 w/wn.....	4	4	4	4	4	4
89	Truck wrecker medium 5-ton 6 x 6 w/wn.....	31	31	31	48	44	43
90	Water purification equip set trk mtd.....	5	5	5	5	5	5

a Total is 0 when division's Engr Bn is equipped with MAB.

b Total is 0 when division's Engr Bn is equipped with M4T6 bridging.

c Total is 5 when division's Engr Bn is equipped with MAB.

d Total is 2 when division's Engr Bn is equipped with MAB.

e Total is 16 when division's Engr Bn is equipped with MAB.

Section V. ARMORED DIVISION

1-16. Armored Division Base—Weapons (TOE 17E)

		1	2	3	4	5	6	7	8	9	10
	Item	Div hq & hq co	Avn bn	(3) Bde hq & hq co	Sig bn	MP co	Armd cav sqdn	Engr bn	Div arty	Spt cmd	Total Div
1	Bipod rifle 7.62-mm.....			(18)		34	26	104		4	168 (186)
2	Gun machine cal .50 hb flex.....	2		9	10		32			(4)	53 (57)
3	Gun machine cal .50 hb OEM.....	3		12 (24)			107	51	74	4	251 (263)
4	Gun machine cal .30 lt OEM.....						18				18
5	Gun machine 7.62-mm lightweight GP.....		6	(15)	3	9	13	15	148 (180)	62 (64)	256 (305)
6	Gun machine 7.62-mm OEM.....	3		9			50	8			70
7	Gun submachine cal .45.....			6			47				53
8	Gun demolition 165-mm OEM.....							8			8
9	Gun tank 76-mm OEM.....						18				18
10	Howitzer sp full-track 8-inch OEM.....								4		4
11	Howitzer sp full-track 155-mm OEM.....								72		72
12	Launcher 762-mm rocket.....								4		4
13	Launcher grenade 40-mm.....			15 (33)	17	16	81	89	147 (189)		365 (425)
14	Launcher rocket 3.5-inch.....			18	26			65	117 (149)	21 (30)	247 (288)
15	Launcher rocket multiple 115-mm.....								9		9
16	Mortar sp 4.2-inch OEM.....						9				9
17	Pistol automatic cal .45.....	31 (33)	70	99 (141)	32	169	304	172	291 (348)	77	1245 (1346)
18	Rifle 90-mm.....			(6)		9					9 (15)
19	Rifle 7.62-mm semiautomatic light barrel.....	111 (123)	248 (263)	309 (435)	543 (550)	138	513 (516)	788 *	2472 (2640)	2106 (2175)	7228 (7628) *
20	Armt subsys cal .30 mg twin XM1.....			18			9				27
21	Armt subsys SS-11.....		3				4				7
21	Armt subsys 2.75-inch rocket XM3.....		15				4				19
23	Armt subsys 7.62-mm mg quad XM6.....		13				9				22
24	Armt subsys 7.62-mm mg twin XM2.....		10						6		16

Notes. 1. (a) These totals are decreased by 5 when equipped with MAB.

2. Parenthetical totals reflect basic TOE plus augmentation.

1-17. Armored Division Base—Vehicles and Vehicular Equipment (TOE 17E)

		1	2	3	4	5	6	7	8	9	10
	Item	Div hq & hq co	Avn bn	(3) Bde hq & hq co	Sig bn	MP co	Armd cav sqdn	Engr bn	Div arty	Spt cmd	Total Div
	VEHICLES AND VEHICULAR EQUIPMENT										
1	Stlr lb 25-ton 4-wheel.....							10			10
2	Stlr lb 60-ton 8-wheel.....							1			1
3	Stlr lb wrecker 12-ton 4-wheel 40 ft.....									1	1
4	Stlr stake 12-ton 4-wheel.....									32	32
5	Stlr tank fuel servicing 5000-gal 4-wheel.....									20	20
6	Stlr tank transporter 50-ton 8-wheel.....									6	6
7	Stlr van cargo 6-ton 2-wheel.....									9	9
8	Stlr van expansible 6-ton 4-wheel.....									4	4
9	Stlr van supply 12-ton 4-wheel.....									3	3
10	Tank cbt full-track lt gun.....						18				18
11	Tank recovery vehicle medium.....							2	1	4	7
12	Trailer ammo 1½-ton 2-wheel.....						2		97		99
13	Trailer amphibious cargo ¼-ton 2-wheel.....	17(18)	11(12)	45	20	45	9	40	75(84)	81(83)	343(356)
14	Trailer cargo ¾-ton 2-wheel.....	4	19(20)	24(27)	48(49)	6	9(10)	13	104(109)	41(55)	268(293)
15	Trailer cargo 1½-ton 2-wheel.....	8	22	12	10	2	19	35	66(93)	254(264)	428(456)
16	Trailer tank water 1½-ton 2-wheel.....	1	3	3	3	1	5	6	25	18(19)	65(66)
17	Truck ambulance field ¾-ton 4 x 4.....	2	1						6	48	57
18	Truck ambulance front line ¼-ton 4 x 4.....						3	1			4
19	Truck cargo ¾-ton 4 x 4.....	4(5)	19	30(33)	67(68)	6	10(11)	18	103(139)	48(63)	305(362)
20	Truck cargo ¾-ton 4 x 4 w/wn.....		7(8)	3	5		3		69	6	93(94)
21	Truck cargo 2½-ton 6 x 6 LWB.....	4	10	12	24(25)	1	9	29	69	166(176)	324(335)
22	Truck cargo 2½-ton 6 x 6 LWB w/wn.....	1	6	3	60	2	14	12	48	88(89)	234(235)
23	Truck cargo 2½-ton 6 x 6 XLWB.....									1	1
24	Truck cargo 5-ton 6 x 6 LWB.....						11				11
25	Truck cargo 5-ton 6 x 6 LWB w/wn.....						9		108		117
26	Truck dump 5-ton 6 x 6 w/wn.....							22			22
27	Truck tank fuel servicing 2½-ton 6 x 6.....		10	3			4		1	10	28
28	Truck tank fuel servicing 2½-ton 6 x 6 w/wn.....				2						2
29	Truck tractor 2½-ton 6 x 6 LWB w/wn.....									1	1
30	Truck tractor 2½-ton 6 x 6 SWB.....									9	9
31	Truck tractor 5-ton 6 x 6 SWB.....							1		47	48
32	Truck tractor 5-ton 6 x 6 SWB w/wn.....									1	1
33	Truck tractor 10-ton 6 x 6 w/single midship wn low mtd 5th whl.....							11			11

34	Truck tractor 10-ton 6 x 6 w/dual midship wn high mtd 5th whl.....									6	6
35	Truck tractor wrecker 5-ton 6 x 6 LBW w/wn.....									1	1
36	Truck utility ¼-ton 4 x 4.....	21 (24)	10 (11)	54	26	45	26	40	113 (143)	89 (91)	444 (460)
37	Truck van expansible 2½-ton 6 x 6.....	4									4
38	Truck van shop 2½-ton 6 x 6.....	4	5		1		1	1	7	33	52
39	Truck van shop 2½-ton 6 x 6 w/wn.....								3	1	4
40	Truck wrecker medium 5-ton 6 x 6 w/wn.....		1		1		3	1	9	16	31
41	Carrier cargo XM548.....								58		58
42	Carrier pers full-track lt armd T120E1.....	3		9			50				62
43	Recovery vehicle full-track lt armd T120E1.....			3			5		4		12
44	Truck lift fork gas pt 6000-lb cap. rough terrain 144 lh.....									3	3
45	Trailer cable reel.....							2			2
46	Carrier cp lt track.....	2		18			6		40 (43)		66 (69)
47	Carrier personnel full-track.....			(12)			25	41			66 (78)
48	Chassis trailer gp 3½-ton 2-wheel.....									1	1
49	Chassis trailer generator 2½-ton 2-wheel.....									4	4
50	Combat engr vehicle full-track.....							8			8
51	Handling unit 762-mm rkt tlr mtd.....								8		8
52	Heating and tiedown unit 762-mm rkt truck mtd.....								8		8
53	Howitzer sp full-track 8-inch.....								4		4
54	Howitzer sp full-track 155-mm.....								72		72
55	Launcher 762-mm rkt trk mtd.....								4		4
56	Launcher rocket multiple 115-mm.....								9		9
57	Mortar sp full-track 4.2-inch.....						9				9
58	Repair shop Sig Corps trk mtd 2½-ton 6 x 6.....				3					16	19

Section VI. INFANTRY DIVISION

1-18. Infantry Division Base—Weapons (TOE 7E)

		1	2	3	4	5	6	7	8	9	10
	Item	Div bq & bq co	Avn bn	(3) Bde hq & bq co	Sig bn	MP co	Armd cav sqdn	Engr bn	Div arty	Spt cmd	Total Div
	WEAPONS										
1	Bipod rifle 7.62-mm			(18)		34	26	104		4	168(186)
2	Gun machine cal .50 hb flex	2		9	10		32			(4)	53(57)
3	Gun machine cal .50 hb OEM						107	5		4	116
4	Gun machine cal .30 lt OEM						18				18
5	Gun machine 7.62-mm light weight GP		6	(6)	3	9	13	15	166(180)	63(65)	275(297)
6	Gun machine 7.62-mm OEM						50	4			54
7	Gun submachine cal .45						47				47
8	Gun demolition 165-mm OEM							4			4
9	Gun tank 76-mm OEM						18				18
10	Howitzer towed 8-inch OEM								4		4
11	Howitzer towed 155-mm OEM								18		18
12	Howitzer towed 105-mm OEM								54		54
13	Launcher 762-mm rocket								4		4
14	Launcher grenade 40-mm			15(33)	17	16	81	89	105(117)		323(353)
15	Launcher rocket 3.5-inch			18	26			65	147(161)	19(28)	275(298)
16	Launcher rocket multiple 115-mm								9		9
17	Mortar sp 4.2-inch OEM						9				9
18	Piston automatic cal .45	27(29)	70	81(123)	32	169	304	157	230(260)	73	1143(1217)
19	Rifle 90-mm			(6)		9					9(15)
20	Rifle 7.62-mm semiautomatic lb	110(122)	248(263)	276(384)	543(550)	138	513(516)	787	2293(2398)	1872(1941)	6780(7099)
21	Armt subsys cal .30 mg twin XM1			18			9				27
22	Armt subsys SS-11		3				4				7
23	Armt subsys 2.75-inch rocket XM3		15				4				19
24	Armt subsys 7.62-mm mg quad XM6		13				9				22
25	Armt subsys 7.62-mm mg twin XM2		10						6		16

Note. Parenthetical totals reflect basic TOE plus augmentation.

1-19. Infantry Division Base—Vehicles and Vehicular Equipment (TOE 7E)

		1	2	3	4	5	6	7	8	9	10
	Item	Div hq & hq co	Avn bn	(3) Bde hq & hq co	Sig bn	MP co	Armd cav sqdn	Engr bn	Div arty	Spt cmd	Total Div
1	Carrier cp lt track						6				6
2	Carrier personnel full-track						25				25
3	Chassis trailer gp 3½-ton 2-wheel									1	1
4	Chassis trailer generator 2½-ton 2-wheel									4	4
5	Combat Engr vehicle full-track							4			4
6	Handling unit 762-mm rkt tlr mtd								8		8
7	Heating and tiedown unit 762-m rkt truck mtd								8		8
8	Howitzer towed 8-inch								4		4
9	Howitzer towed 155-mm								18		18
10	Howitzer towed 105-mm								54		54
11	Launcher 762-mm rkt trk mtd								4		4
12	Launcher rocket multiple 115-mm								9		9
13	Mortar sp full-track 4.2-inch						9				9
14	Repair shop Sig Corps trk mtd 2½-ton 6 x 6				3					16	19
15	Stlr lb 25-ton 4-wheel							14			14
16	Stlr lb 60-ton 8-wheel							1			1
17	Stlr lb wrecker 12-ton 4-wheel 40-ft									1	1
18	Stlr stake 12-ton 4-wheel									30	30
19	Stlr tank fuel servicing 5000-gal 4-wheel									10	10
20	Stlr tank transporter 50-ton 8-wheel									2	2
21	Stlr van cargo 6-ton 2-wheel									9	9
22	Stlr van expansible 6-ton 4-wheel									4	4
23	Stlr van supply 12-ton 4-wheel									3	3
24	Tank cbt full-track lt gun						18				18
25	Tank recovery vehicle medium							1		4	5
26	Trailer amphibious cargo ¼-ton 2-wheel	17(18)	11(12)	57	20	45	9	40	84(93)	79(81)	362(375)
27	Trailer ammo 1½-ton 2-wheel						2		76		78
28	Trailer cargo ¾-ton 2-wheel	4	19(20)	30(33)	48(49)	6	9(10)	17	133(141)	40(54)	306(334)
29	Trailer cargo 1½-ton 2-wheel	10	22	18	10	2	19	35	64	220(230)	400(410)
30	Trailer tank water 1½-ton 2-wheel	1	3	3	3	1	5	6	22	18(19)	62(63)
31	Truck ambulance field ¾-ton 4 x 4	2	1						6	48	57
32	Truck ambulance front line ¼-ton 4 x 4						3	1			4
33	Truck cargo ¾-ton 4 x 4	4(5)	19	33(36)	67(68)	6	10(11)	23	120(138)	47(62)	329(368)
34	Truck cargo ¾-ton 4 x 4 w/wn		7(8)	3	5		3		69	6	93(94)
35	Truck cargo 2½-ton 6 x 6 LWB	4	10	9	24(25)	1	9	29	66	153(163)	305(316)
36	Truck cargo 2½-ton 6 x 6 LWB w/wn	3	6	3	60	2	14	12	150	88(89)	338(339)
37	Truck cargo 2½-ton 6 x 6 XLWB									1	1

		1	2	3	4	5	6	7	8	9	10
	Item	Div hq & hq co	Avn bn	(8) Bde hq & hq co	SIG bn	MP co	Armd cav sqdn	Engr bn	Div arty	Spt cmd	Total Div
38	Truck cargo 5-ton 6 x 6 LWB.....						11				11
39	Truck cargo 5-ton 6 x 6 LWB w/wn.....						9		50		59
40	Truck cargo 10-ton 6 x 6 w/wn.....								4		4
41	Truck dump 5-ton 6 x 6 w/wn.....							58			58
42	Truck tank fuel servicing 2½-ton 6 x 6.....		10	3			4		1	10	28
43	Truck tank fuel servicing 2½-ton 6 x 6 w/wn.....				2						2
44	Truck tractor 2½-ton 6 x 6 LWB w/wn.....									1	1
45	Truck tractor 2½-ton 6 x 6 SWB.....									9	9
46	Truck tractor 5-ton 6 x 6 SWB.....							1		35	36
47	Truck tractor 5-ton 6 x 6 SWB w/wn.....									1	1
48	Truck tractor 10-ton 6 x 6 w/single midship wn low mtd 5th wheel.....							15			15
49	Truck tractor 10-ton 6 x 6 w/dual midship wn high mtd 5th wheel.....									2	2
50	Truck tractor wrecker 5-ton 6 x 6 XLWB w/wn.....									1	1
51	Truck utility ¼-ton 4 x 4.....	21(24)	10(11)	66	26	45	26	40	143(153)	88(90)	465(481)
52	Truck van expansible 2½-ton 6 x 6.....	4									4
53	Truck van shop 2½-ton 6 x 6.....	4	5	6	1		1	1	11	28	57
54	Truck van shop 2½-ton 6 x 6 w/wn.....								3	1	4
55	Truck wrecker medium 5-ton 6 x 6 w/wn.....		1	3	1		3	1	9	13	31
56	Carrier cargo XM548.....										
57	Carrier personnel full-track armored T114.....						50				50
58	Recovery vehicle full-track lt armd T120E1.....						5				5
59	Truck lift fork gas pt 6000-lb cap. rough terrain 144 lh.....									3	3
60	Trailer cable reel.....							2			2

Section VII. MECHANIZED DIVISION

1-20. Mechanized Division Base—Weapons (TOE 37E)

		1	2	3	4	5	6	7	8	9	10
	Item	Div hq & hq co	Avn bn	(3) Bde bq & hq co	Sig bn	MP co	Armd cav sqdn	Engr bn	Div arty	Spt cmd	Total Div
1	Bipod rifle 7.62-mm.....			(18)		34	26	104		4	168(186)
2	Gun machine cal .50 hb flex.....	2		9	10		32			(4)	53(57)
3	Gun machine cal .50 hb OEM.....	3		12(24)			107	51	74	4	251(263)
4	Gun machine cal .30 lt OEM.....						18				18
5	Gun machine 7.62-mm lightweight GP.....		6	(15)	3	9	13	15	148(180)	63(65)	257(306)
6	Gun machine 7.62-mm OEM.....	3		9			50	8			70
7	Gun submachine cal .45.....			6			47				53
8	Gun demolition 165-mm OEM.....							8			8
9	Gun tank 76-mm OEM.....						18				18
10	Howitzer sp full-track 8-inch OEM.....								4		4
11	Howitzer sp full-track 155-mm OEM.....								72		72
12	Launcher 762-mm rocket.....							4			4
13	Launcher grenade 40-mm.....			15(33)	17	16	81	89	147(189)		365(425)
14	Launcher rocket 3.5-inch.....			18	26			65	117(149)	21(30)	247(288)
15	Launcher rocket multiple 115-mm.....								9		9
16	Mortar sp 4.2-inch OEM.....						9				9
17	Pistol automatic cal .45.....	30(32)	70	99(141)	32	169	304	172	291(348)	75	1242(1343)
18	Rifle 90-mm.....			(6)		9					9(15)
19	Rifle 7.62-mm semiautomatic light barrel.....	111(123)	248(263)	309(435)	543(550)	138	513(516)	788 *	2472(2640)	2040(2109)	7163(7563) *
20	Armt subsys cal .30 mg twin XM1.....			18			9				27
21	Armt subsys SS-11.....		3				4				7
22	Armt subsys 2.75-inch rocket XM3.....		15				4				19
23	Armt subsys 7.62-mm mg quad XM6.....		13				9				22
24	Armt subsys 7.62-mm mg twin XM2.....		10						6		16

Note. 1. (*) These totals are decreased by 5 when equipped with MAB.
2. Parenthetical totals reflect basic TOE plus augmentation.

1-21. Mechanized Division—Vehicles and Vehicular Equipment (TOE 37E)

		1	2	3	4	5	6	7	8	9	10
	Item	Div hq & hq co	Avn bn	(8) Bde hq & hq co	Sig bn	MP co	Armd cav sqdn	Engr bn	Div arty	Spt cmd	Total Div
	VEHICLES AND VEHICLE EQUIPMENT										
1	Carrier cp lt track.....	2		18			6		40(43)		66(69)
2	Carrier personnel full-track.....			(12)			25	41			66(78)
3	Chassis trailer GP 2½-ton 2-wheel.....									1	1
4	Chassis trailer generator 2½-ton 2-wheel.....									4	4
5	Combat Engr vehicle full-track.....							8			8
6	Handling unit 762-mm rkt tlr mtd.....								8		8
7	Heating and tiedown unit 762-mm rkt truck mtd.....								8		8
8	Howitzer sp full-track 8-inch.....								4		4
9	Howitzer sp full-track 155-mm.....								72		72
10	Howitzer sp full-track 105-mm.....										
11	Launcher 762-mm rkt trk mtd.....								4		4
12	Launcher rocket multiple 115-mm.....								9		9
13	Mortar sp full-track 4.2-inch.....						9				9
14	Repair shop Sig Corps trk 2½-ton 6 x 6.....				3					16	19
15	Stlr lb 25-ton 4-wheel.....							10			10
16	Stlr lb 60-ton 8-wheel.....							1			1
17	Stlr lb wrecker 12-ton 4-wheel 40-ft.....									1	1
18	Stlr stake 12-ton 4-wheel.....									32	32
19	Stlr tank fuel servicing 5000-gal 4-wheel.....									20	20
20	Stlr tank transporter 50-ton 8-wheel.....									6	6
21	Stlr van cargo 6-ton 2-wheel.....									9	9
22	Stlr van expansible 6-ton 4-wheel.....									4	4
23	Stlr van supply 12-ton 4-wheel.....									3	3
24	Tank cbt full-track lt gun.....						18				18
25	Tank recovery vehicle medium.....							2	1	4	7
26	Trailer ammo 1½-ton 2-wheel.....						2		97		99
27	Trailer amphibious cargo ¼-ton 2-wheel.....	17(18)	11(12)	45	20	45	9	40	75(84)	79(81)	341(354)
28	Trailer cargo ¾-ton 2-wheel.....	4	19(20)	24(27)	48(49)	6	9(10)	13	104(109)	41(55)	268(293)
29	Trailer cargo 1½-ton 2-wheel.....	8	22	12	10	2	19	35	66(93)	251(261)	425(453)
30	Trailer tank water 1½-ton 2-w.....	1	3	3	3	1	5	6	25	18(19)	65(66)
31	Truck ambulance field ¾-ton 4 x 4.....	2	1						6	48	57
32	Truck ambulance front line ¼-ton 4 x 4.....						3	1			4
33	Truck cargo ¾-ton 4 x 4.....	4(5)	19	30(33)	67(68)	6	10(11)	18	103(139)	48(63)	305(362)

34	Truck cargo 3/4-ton 4 x 4 w/wn		7(8)	3	5		3		69	6	93(94)
35	Truck cargo 2 1/2-ton 6 x 6 LWB	4	10	12	24(25)	1	9	29	69	163(173)	321(332)
36	Truck cargo 2 1/2-ton 6 x 6 LWB w/wn	1	6	3	60	2	14	12	48	88(89)	234(235)
37	Truck cargo 2 1/2-ton 6 x 6 XLWB									1	1
38	Truck cargo 5-ton 6 x 6 LWB						11				11
39	Truck cargo 5-ton 6 x 6 LWB w/wn						9		108		117
40	Truck dump 5-ton 6 x 6 w/wn							22			22
41	Truck tank fuel servicing 2 1/2-ton 6 x 6		10	3			4		1	10	28
42	Truck tank fuel servicing 2 1/2-ton 6 x 6 w/wn				2						2
43	Truck tractor 2 1/2-ton 6 x 6 LWB w/wn									1	1
44	Truck tractor 2 1/2-ton 6 x 6 SWB									9	9
45	Truck tractor 5-ton 6 x 6 SWB							1		47	48
46	Truck tractor 5-ton 6 x 6 SWB w/wn									1	1
47	Truck tractor 10-ton 6 x 6 w/single midship wn low mtd 5th whl							11			11
48	Truck tractor 10-ton 6 x 6 w/dual midship wn high mtd 5th whl									6	6
49	Truck tractor wrecker 5-ton 6 x 6 XLWB w/wn									1	1
50	Truck utility 1/4-ton 4 x 4	21(24)	10(11)	54	26	45	26	40	133(143)	90(92)	445(461)
51	Truck van expansible 2 1/2-ton 6 x 6	4									4
52	Truck van shop 2 1/2-ton 6 x 6	4	5		1		1	1	7	32	51
53	Truck van shop 2 1/2-ton 6 x 6 w/wn								3	1	4
54	Truck wrecker med 5-ton 6 x 6 w/wn		1		1		3	1	9	16	31
55	Carrier cargo XM548								58		58
56	Carrier personnel full-track armored T114	3		9			50				62
57	Recovery vehicle full-track lt armd T120E1			3			5		4		12
58	Truck lift fork gas 6000-lb cap. rough terrain 144LH									3	3
59	Trailer cable reel							2			2

Section VIII. ENGINEER SHORE ASSAULT UNITS

1-22. General

a. Engineer amphibious units are designed to provide personnel and units for performance of combat and combat support missions when suitably augmented, interim logistical support functions as part of an army force executing assault landing operations. These amphibious units, whose specific capabilities are listed in paragraph 1-23, are employed in joint or unilateral operations in support of combat forces conducting ship-to-shore or major water barrier crossing operations.

b. Engineer amphibious units provide the following support:

- (1) The engineer amphibious unit commander and commanders of shore party components serve as special staff assistants to the Army landing force commander and commanders of subordinate landing force echelons during planning for the amphibious attack.
- (2) Engineer amphibious units provide command, control, and limited combat engineer support for battalion, brigade, division, and corps landing team shore parties. It is necessary, however, to supplement engineer amphibious units with other combat support and combat service support units to provide shore parties to meet a specific tactical situation.
- (3) Engineer amphibian assault units provide a means of ship-to-shore or shore-to-shore movement as well as cross-country mobility to assault landing teams. The use of amphibians which provide both armor protection and mobility, makes possible a rapid, continuous movement to relatively deep initial objectives without delay at the landing beach. Amphibians are also capable of delivering critical supplies direct to assaulting inland elements and of expediting the evacuation of medical patients and prisoners of war without transfer on the

beaches. To maintain an amphibious capability, amphibian vehicles in a logistical role should be replaced as soon as practicable by tactical carriers and organic vehicles.

c. The TOE organizations of engineer amphibious elements are limited to units of company size designed to operate either as control headquarters or in direct support of an amphibious operation. Engineer shore assault companies are allocated to an amphibious task force both in type and number in accordance with the anticipated tactical situation. The following data are based on FM 5-144 and recommended TOE plans, and represent the best data currently available.

1-23. Engineer TOE Shore Assault Units

a. The Engineer Amphibious Brigade coordinates and controls corps beach support area development initiated by multiple divisions or assumes control and substantially expands the beach support area development accomplished by a single assaulting division. It also provides the command and staff required to control the corps shore party and one to four attached engineer amphibious groups.

b. The Engineer Amphibious Group coordinates and controls beach support at division level and provides the command and staff required to control the division shore party and one to three engineer amphibious battalions in accordance with the tactical situation.

c. The Engineer Amphibious Battalion provides the command and control for the shore party of a brigade-size landing force during amphibious or shore-to-shore operations and provides tactical amphibian mobility for dismounted combat units in the passage of water barriers. It consists of a headquarters and headquarters company, one Engineer Amphibious Company, and two Engineer Amphibian Assault Companies (one at reduced strength).

- (1) Headquarters and headquarters company provides the command and control staff required to support a

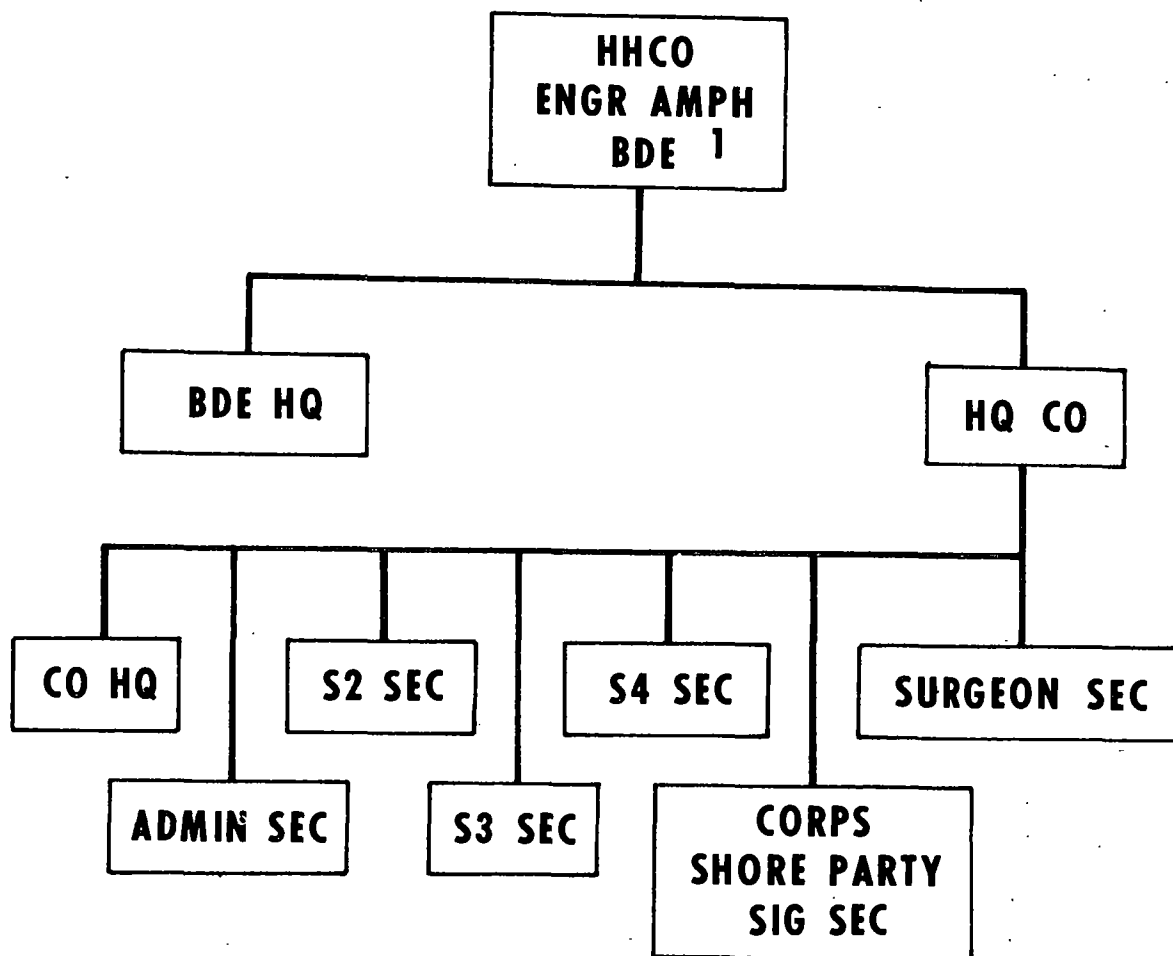
brigade-size landing force of two included battalion landing teams.

- (2) The Engineer Amphibious Company provides the command and control personnel, and Engineer and Signal support elements required as shore

party by one brigade-size assault landing employing no more than two separated battalion landing team assaults.

- (3) The Engineer Amphibian Assault Company provides tactical amphibian mobility for dismounted combat units

HEADQUARTERS AND HEADQUARTERS COMPANY ENGINEER AMPHIBIOUS BRIGADE



¹ One to four Engineer Amphibious Groups attached.

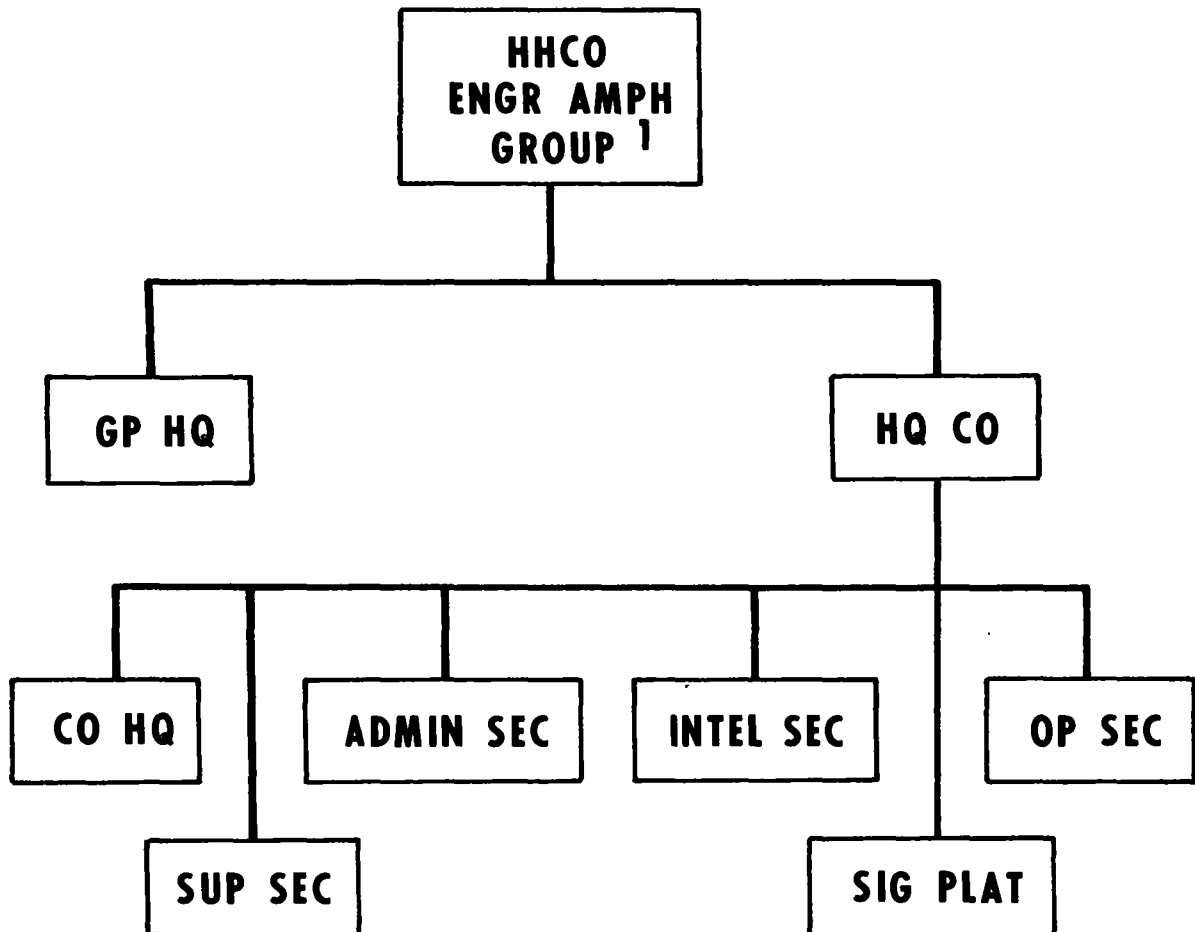
Figure 1-14

in the passage of water barriers, which includes landings on hostile shores and major river crossings; also provides skills and equipment to train other units assigned amphibious missions in amphibious or shore-to-shore operations.

d. Headquarters and Headquarters Company
—*Engineer Amphibious Brigade, TOE 5-401E*
(fig. 1-14).

e. Headquarters and Headquarters Company
—*Engineer Amphibious Group, TOE 5-402E*
(fig. 1-15).

HEADQUARTERS AND HEADQUARTERS COMPANY ENGINEER AMPHIBIOUS GROUP



¹ One to three Engineer Amphibious Battalions attached.

Figure 1-15

f. Engineer Amphibious Battalion, TOE 5-405E (fig. 1-16).

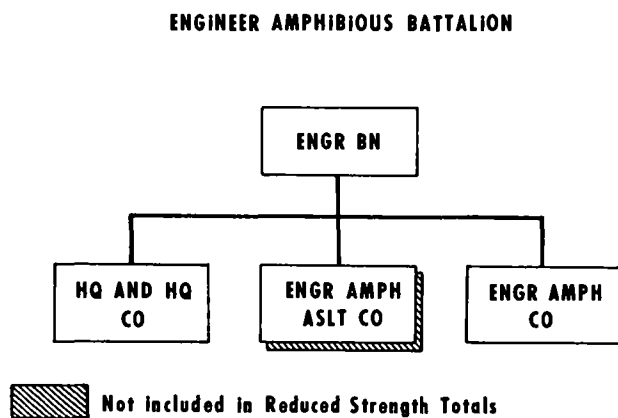
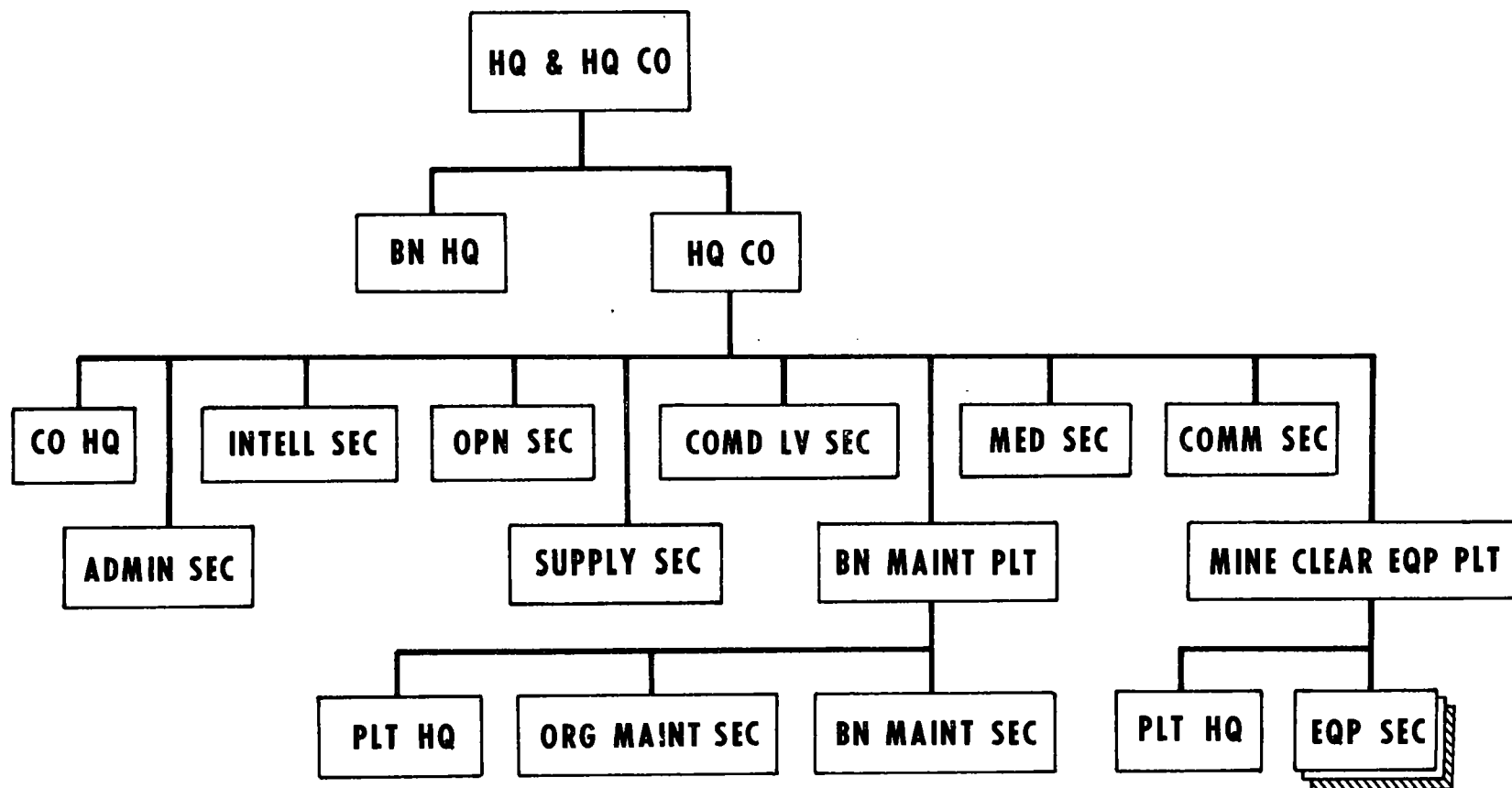


Figure 1-16

HQ & HQ COMPANY, ENGINEER AMPHIBIOUS BATTALION



Not included in Reduced Strength Organization

Figure 1-17

h. Engineer Amphibian Assault Company, TOE 5-407E (fig. 1-18).

ENGINEER AMPHIBIAN ASSAULT COMPANY

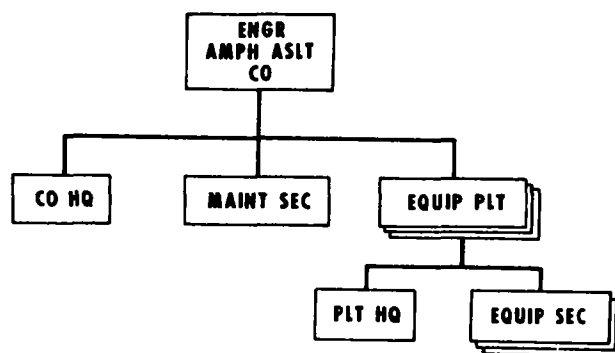


Figure 1-18

i. Engineer Amphibious Company, TOE 5-408E (fig. 1-19).

ENGINEER AMPHIBIOUS COMPANY

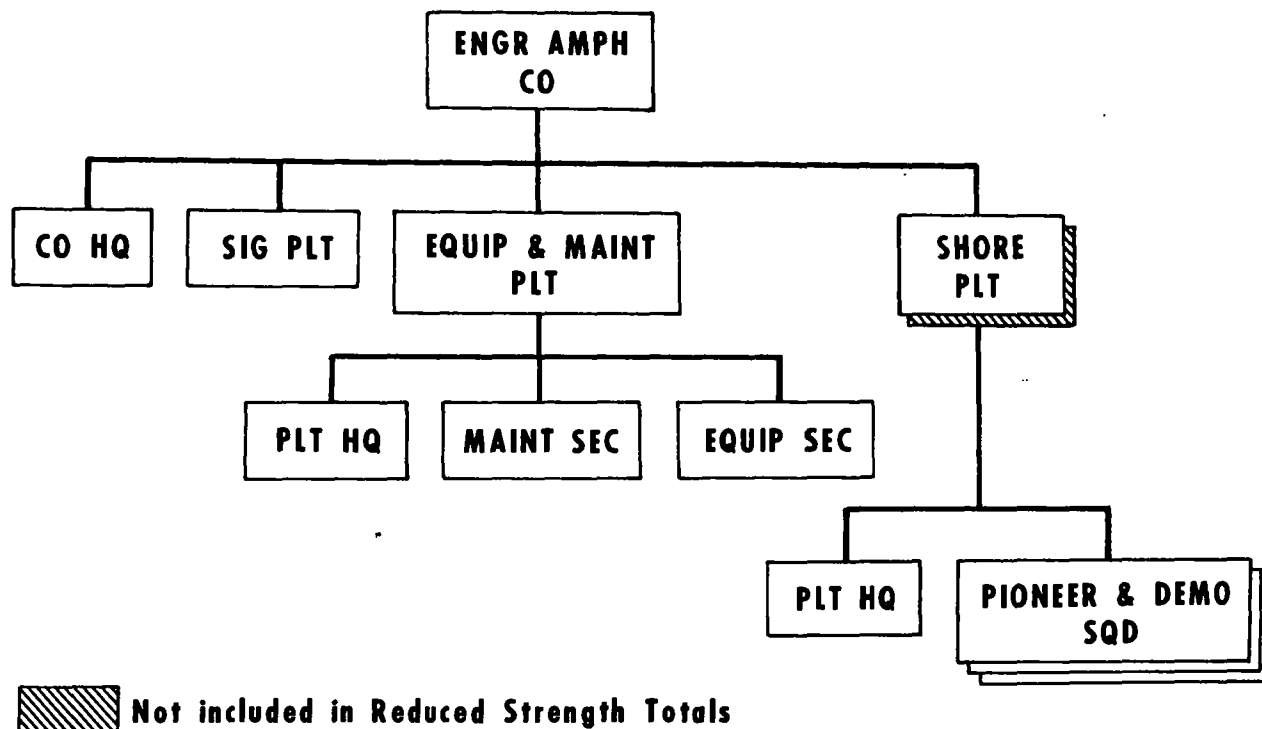


Figure 1-19

1-24. Engineer Shore Assault Units—Weapons

	1	2	3	4	5	6	7
1	Item	Total engr amph bde	H&HCO engr amph bde	H&HCO engr amph gp	H&HCO engr amph bn	Engr amph co	Engr amph aslt co
2	Rifle, semiauto, 7.62-mm, lt barrel.....	3,867	87	75	151	162	41
3	Pistol, auto, cal .45.....	2,401	19	17	47	10	101
4	Launcher, rocket, 3.5 in.....	201	3	3	2	11	4
5	Machine gun, lt, flexible.....	91	1	3	5	4	-----
6	Individual weapons.....	6,268	106	92	198	172	142
7	Crew-served weapons.....	292	4	6	7	15	4
8	Total weapons.....	6,560	110	98	205	187	146

Notes. 1. Based on an Engineer Amphibious Brigade consisting of three groups each of which has three battalions attached. All units at full strength.

2. In addition to the weapons listed, each landing vehicle, tracked, has a 7.62-mm machinegun, and each combat engineer vehicle (CEV) has a 165-mm demolition gun, a 7.62-mm machinegun, and a .50 cal machinegun.

1-25. Engineer Shore Assault Units—Vehicles and Major Operational Equipment

1	2	3	4	5	6	7
Item	Total enr amph bde	H&HCO enr amph bde	H&HCO enr amph gp	H&HCO enr amph bn	Engr amph co	Engr amph aslt co
<i>Tracked Vehicles</i>						
2 Combat enr veh, full trkd.....	18				2	
3 Landing vehicle, trkd, engineer.....	90			10		
4 Landing vehicle, trkd, personnel, command.....	54			6		
5 Landing vehicle, trkd, personnel.....	540					30
6 Landing vehicle, trkd, recovery.....	36			2		1
7 Total tracked vehicles.....	738			18	2	31
<i>Wheeled Vehicles</i>						
8 Lighter, amphibious, (LARC 5), self-propelled, 5T.....	36				4	
9 Shop equip, contact maint, truck mounted.....	36			2	2	
10 Shop equip, org rep, light, truck mounted.....	9			1		
11 Truck, ambulance, ¾-ton.....	18			2		
12 Truck, cargo, ¾-ton.....	328	10	13	16	11	2
13 Truck, cargo, 2½-ton.....	207	6	7	8	4	4
14 Truck, dump, 5-ton.....	99				11	
15 Truck, wrecker, med, 5-ton.....	9			1		
16 Truck, tank, fuel servicing, 2½-ton.....	31	1				
17 Truck, tractor, 2½-ton.....	36			1	1	1
18 Truck, tractor, 10-ton w/single midship winch, low mounted 5th wheel.....	72			2	4	1
19 Truck, utility, ¼-ton.....	238	16	8	14	6	1
20 Total wheeled vehicles.....	1,089	33	28	47	43	9
<i>Trailers</i>						
21 Chamber, recompression, divers, trlr mtd.....	9			1		
22 Lubricating and servicing unit, power-op, trlr mtd, 15 cfm, winterized.....	36			1	1	1
23 Pneumatic tool and compressor outfit, 250 cfm, trlr mtd.....	9				1	
24 Strlr, low bed, 25-ton, 4 whl.....	36				4	
25 Strlr, low bed, 60-ton, 8 whl.....	36			2		1
26 Strlr, rep parts, shop van, 6-ton.....	36			1	1	1
27 Trlr, amph, cgo, ¼-ton, 2-whl.....	238	16	8	14	6	1
28 Trlr, cgo, ¾-ton, 2-whl.....	309	9	13	15	12	1
29 Trlr, cgo, 1½-ton, 2-whl.....	131	5	6	4	6	1
30 Trlr, basic util, 2½-ton.....	54				6	
31 Trlr, tank, water, 1½-ton, 2-whl.....	40	1	1	1	1	1
32 Welding shop, cgo trlr mtd, 300 amp.....	18			1	1	
33 Total trailers.....	952	31	28	40	39	7
<i>Major Operational Equipment</i>						
34 Crane-shovel, whl mtd, 20-ton, ¾-cu yd, rough terrain.....	18				2	
35 Grader, road, mtzd, DED, 4 x 4, all whl steer.....	18				2	
36 Tractor, full trkd, low spd, DED, med DBP, w/ bulldoz hyd tilting, w/scarifier, winch rear, 1 dr.....	36				4	
37 Total major operational equipment.....	72				8	

Note. Based on an Engineer Amphibious Brigade consisting of three groups each of which has three battalions. All units at full strength.

Section IX. U.S. ARMY MISSILE COMMAND

1-26. General

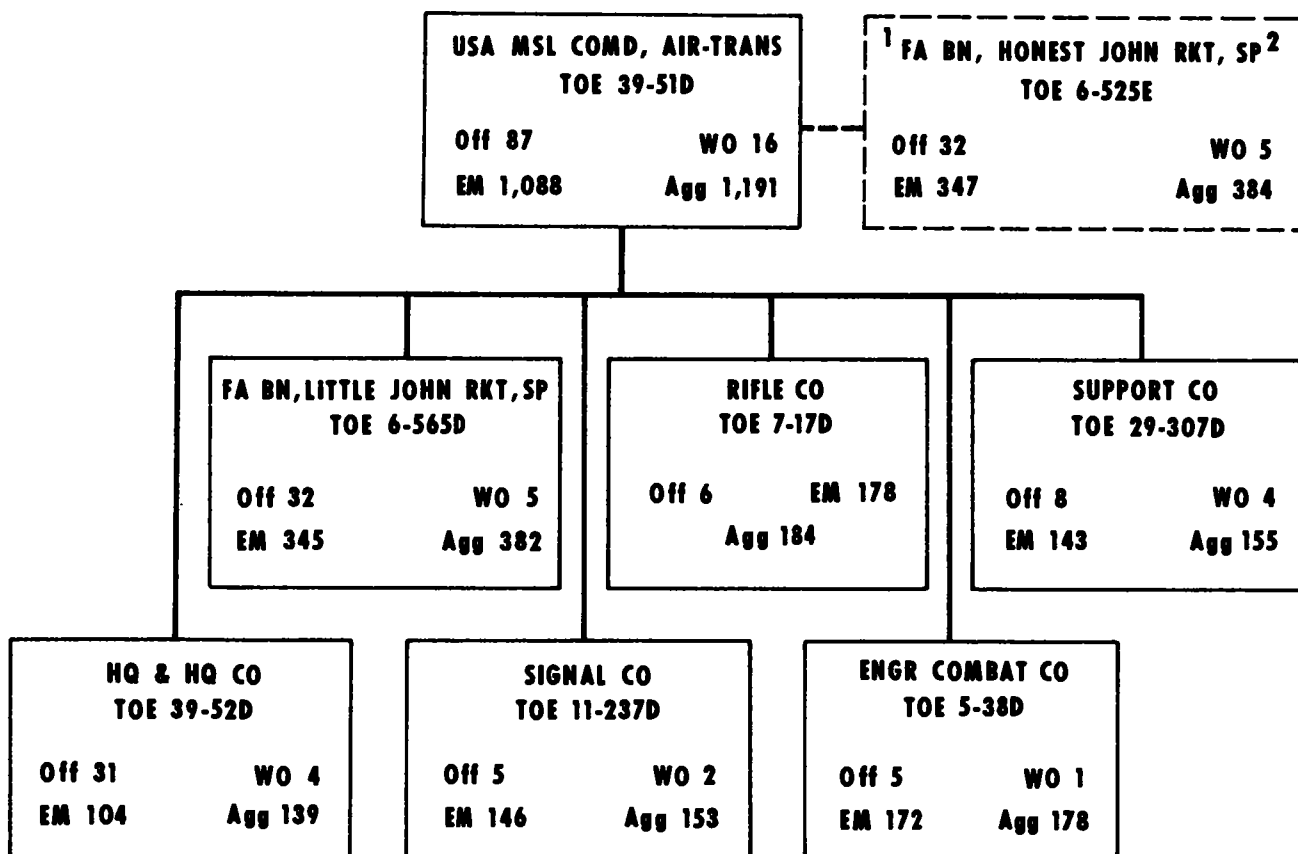
The U.S. Army missile commands are organized as tactical units to provide nuclear fire support to United States or allied ground forces in any area of the world with minimum warning. The missile command (air-transportable) deployment is determined by the nature of the mission. The U.S. Army missile command is assigned to theaters of operation and may be allocated as required. The data for the missile command contained in this section is based on current TOE and should be used only for planning purposes and service school instruction.

1-27. U. S. Army Missile Command, Air-Transportable, TOE 39-51D

a. *Organization Chart* (fig. 1-20).

b. *U.S. Army Missile Command, Air-Transportable—Capabilities.*

- (1) Supports, by nuclear fire, counter-aggression forces or reinforces indigenous forces in localized hostilities.
- (2) Is air-transportable.
- (3) Acquires and develops target data.
- (4) Supports itself logistically after resupply has been delivered to the command.



¹ To be replaced by FA BN LITTLE JOHN. Not included in TOE 39-51D totals.

² Includes electronic meteorological section augmentation.

Figure 1-20

- (5) Is responsible for organizational maintenance. It requires attachment of, or support by, Engineer, Ordnance, and Transportation (aircraft) units for direct support maintenance.
- (6) Provides limited evacuation and medical care.
- (7) Provides radiation detection and decontamination.
- (8) Is organized as a tactical and administrative unit and is self-sustaining when operating in the vicinity of U.S. forces. When it operates in support of Allied forces isolated from U.S. facilities, the attachment of technical and logistical support cellular detachments may be required. This also in-

cludes a requirement for the establishment of a special logistical linkage between port and/or airhead facilities and the missile command.

- (9) Must be provided air defense protection by supported forces or by attached air defense units.
- (10) Survey control must be provided the Little John battalion by the supporting Engineer company or by attachment of an Engineer survey team of the TOE 5-500 type.
- (11) Is dependent upon outside agencies for assistance in evacuation and medical care.

c. U.S. Army Missile Command, Air-Transportable—Weapons.

	1	2	3	4	5	6	7	8	*9
1	Weapons	Total msl comd	HQ & HQ co	LJ Bn	Sig co	Rifle co	Spt co	Engr cmbt co	HJ Bn
2	Gun, mach, cal .50, Bng, hv bbl, flex.....	18			3		11	4	
3	Gun, mach, 7.62-mm, lt-weight, GP.....	48		35	1	6		6	28
4	Launcher, 762-mm rkt, trk-mtd.....	6							6
5	Launcher, rkt, 3.5-in.....	53		29	3	7	5	9	22
6	Mortar, 81-mm, on mount.....	3				3			
7	Pistol, semiauto, cal .45.....	141	18	86	5	29	2	1	81
8	Rifle, semiauto, 7.62-mm lt bbl.....	1038	119	295	148	158	141	177	303
9	Rifle, 106-mm, on mount.....	2				2			
10	Launcher, 318-mm rkt.....	6		6					
11	Individual weapons.....	1179	137	381	153	187	143	178	384
12	Crew-served weapons.....	130		70	7	18	16	19	56
13	Total weapons.....	1309	137	451	160	205	150	197	440

* Not included in totals.

d. U.S. Army Missile Command, Air-Transportable—Vehicles and Major Vehicular Equipment.

	1	2	3	4	5	6	7	8	*9
1	Weapons	Total msl comd	HQ & HQ co	LJ Bn	Sig co	Rifle co	Spt co	Engr cmbt co	HJ Bn
	AIRCRAFT								
2	Airplane, obsn, lt.....	2	2						
3	Airplane, obsn, med.....	4	4						
4	Helicopter, util.....	4	2	2					
5	Total aircraft.....	10	8	2					

See footnotes at end of table.

	1	2	3	4	5	6	7	8	*9
1	Item	Total msl comd	HQ & HQ co	LJ Bn	Sig co	Rifle co	Spt co	Engr cmbt co	HJ Bn
	TRACKED VEHICLES								
6	Tractor, full-tracked, low-speed, diesel-driven, med, DBP, w/angledoz, scarif, front, 1 dr winch.....	2						2	
7	Total tracked veh.....	2						2	
	WHEELED VEHICLES								
8	Decontaminating apparatus, power-driven, trk-mtd.....	1					1		
9	Heating and tiedown unit, 7.62-mm rkt, trk-mtd.....								12
10	Handling unit, 318-mm rkt, trk-mtd.....	6		6					
11	Launcher, 7.62-mm rkt, trk-mtd.....								6
12	Trk, util, ¼-ton, 4 x 4.....	80	13	42	7	3	6	9	34
13	Trk, util, ¼-ton, 4 x 4, carr for 106-mm rifle.....	2				2			
14	Trk, amb, ¾-ton 4 x 4.....	5		1			4		1
15	Trk, cgo, ¾-ton, 4 x 4.....	91	4	52	19	5	5	6	31
16	Trk, cgo, ¾-ton, 4 x 4, WWN.....	6		6					6
17	Trk, cgo, 2½-ton, 6 x 6, LWB.....	50	5	8	8		24	5	16
18	Trk, cgo, 2½-ton, 6 x 6 LWB, WWN.....	21	4	10	3	1	3		12
19	Trk, dump, 2½-ton, 6 x 6.....	12						12	
20	Trk, shop van, 2 ½-ton, 6 x 6.....	5	1	2			2		5
21	Trk, tk, gas, 2½-ton, 6 x 6 kit segregator.....	4	2				2		
22	Trk, wkr, lt, w ½-ton, 6x 6, WWN.....	1		1					
23	Trk, cgo, 5-ton, 6 x 6, XLWB, WWN.....	18					18		
24	Trk, tractor, 5-ton, SWB, WWN.....	3					1	2	
25	Trk, med wkr, 5-ton, 6 x 6, WWN.....	2					2		7
26	Total wheeled vehicles.....	307	29	128	37	11	68	34	130
	TRAILERS								
27	Battery charger genr set, tlr-mtd PP-1087/U.....	1					1		
28	Chassis, tlr, genr, 2½-ton, 2-wheel.....	1	1						
29	Genr set assembly, gas eng, tlr-mtd, PU-322/G.....	1			1				
30	Genr, set, gas eng, tlr-mtd, PU-290/MR.....	3	1		2				
31	Genr set, gas eng, tlr-mtd, PU-322/C.....	1	1						
32	Pneumatic tool and compressor outfit, 210 CFM, tlr-mtd.....	1						1	
33	Stlr, low-bed, 25-ton, 4-wheel.....	3					1	2	
34	Tlr, amph, cgo, ¼-ton, 2-wheel.....	46	12	16	3	3	4	8	16
35	Tlr, cgo, ¾-ton, 2-wheel.....	61	4	35	11	5	3	3	30
36	Tlr, cgo, 1½-ton, 2-wheel.....	60	5	15	5		30	5	13
37	Tlr, tk, water, 1½-ton, 2-wheel.....	10	1	5	1	1	1	1	5
38	Tlr, basic util, 2½-ton, 2-wheel.....	9						9	
39	Tlr, 7.62-mm rkt transporter.....								12
40	Water purification equipment set, tlr-mtd, dia- tomite filter, 600 GPM.....	2						2	
41	Cart, rkt, transport, 318-mm.....	12		12					
42	Transporter, liq, RW, 100 gal.....	1		1					
43	Total tlr.....	212	25	84	23	9	40	31	76
	MAJOR VEHICULAR EQUIPMENT								
44	Grader, road, mtz, diesel-driven, hv.....	1						1	
45	Loader, scoop-type, diesel-driven, 4-wheel, 1½- cu yd.....	1						1	

* Not included in totals.

Section X. SPECIAL FORCES GROUP, AIRBORNE**1-28. General**

The Airborne Special Forces Group (SFG) is organized to plan and conduct all aspects of unconventional warfare in areas not under friendly control. Special forces is a strategic force employed under the direction of the unified command. It is primarily deployed to develop, organize, equip, train, and direct indigenous forces in the conduct of guerrilla warfare and to advise, train, and assist host country forces in counterinsurgency operations. For special forces responsibilities in counterinsurgency operations, see FM 31-22, U.S. Army Counterinsurgency Forces.

a. Organizational chart (fig. 1-21).

b. The Special Forces Group capabilities are—

- (1) To establish a special forces operational base.

- (2) To establish and operate concurrently up to four subordinate control bases or separate operational bases.
- (3) To command and control deployed special forces elements by long-range communications.
- (4) To coordinate supply of deployed special forces detachments.
- (5) To infiltrate operational detachments by air, sea, or land into areas under friendly control to conduct all aspects of unconventional warfare operations.
- (6) To conduct counterinsurgency and counter guerrilla warfare planning in support of United States cold war objectives.
- (7) To train, advise, and assist indigenous forces in support of United States cold war objectives.

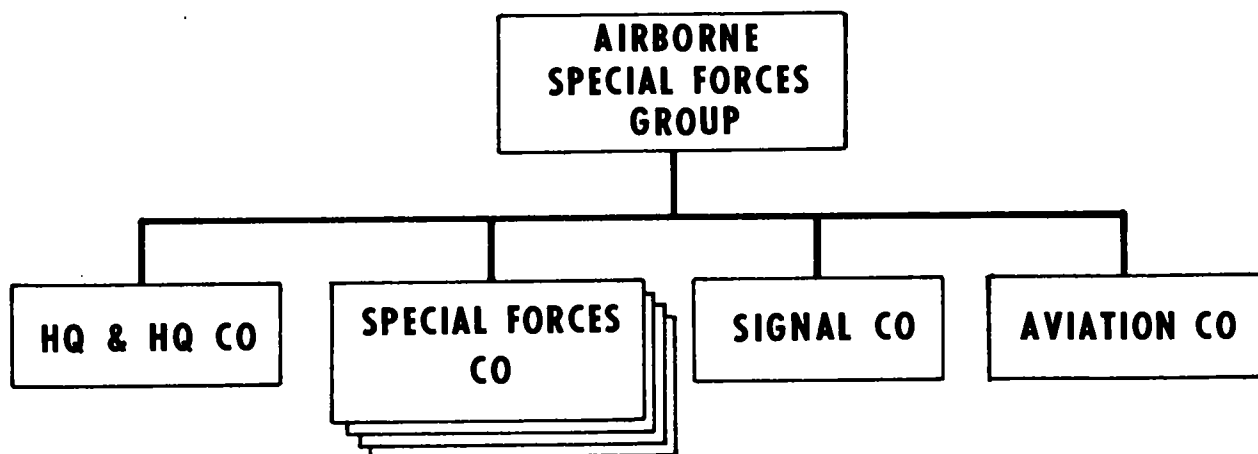


Figure 1-21

c. U.S. Special Forces Group, Weapons, Vehicles, and Major Operational Equipment.

	1	2	3	4	5	6
1	Item	Total Amount TOE 31- 106E	TOE 31- 106E HQ & HQ CO	TOE 31- 107E SF Forces Co (4 ea)	TOE 1- 307E Aviation Co	TOE 11- 247E SIG Co
	WEAPONS					
2	Gun, Mach, cal .30 BRG M1917A1.....	24	24			
3	Gun, Mach, cal .30 BRG M1919A6.....	24	24			
4	Gun, Mach, 7.62-mm Lt Wt, GP.....	24	24			
5	Launcher, Grenade 40-mm.....	31			31	
6	Launcher, Rkt 3.5-In.....	24	24			
7	Mortar, 60-mm on Mtd.....	24	24			
8	Pistol, Automatic cal .45.....	1038	28	232	80	2
9	Rifle, 57-mm.....	24	24			
10	Rifle, 7.62-mm Semiauto Lt Bbl.....	1481	213	243	115	181
11	Rifle, Auto cal .30 BRG M1918A2.....	24	24			
12	Rifle, cal .30 Sniper.....	48	48			
13	Total Weapons.....	2766	457	475	226	183
	AIRCRAFT					
14	Airplane, cargo transport stol CV 2B.....	4			4	
15	Helicopter utility, UH-1B.....	2			2	
16	Helicopter utility, HU-1D.....	10			10	
17	Airplane utility.....	4			4	
18	Total Aircraft.....	20			20	
	WHEELED VEHICLES					
19	Trk, amb, field, ¾-ton, 4 x 4.....	3	3			
20	Trk, Cargo, ¾-ton, 4 x 4.....	6	3		2	1
21	Trk, Cargo, ¾-ton, 4 x 4.....	5			5	
22	Trk, Cargo, 2½-ton, 6 x 6 LWB.....	32	9		5	18
23	Trk, tank fuel servicing, 2½-ton 6 x 6.....	4			4	
24	Trk, cargo, 2½-ton, 6 x 6 w/wn.....	13	1		5	7
25	Trk, tractor, 2½-ton, 6 x 6 w/wn LWB.....	1			1	
26	Trk, tractor, 5-ton, 6 x 6 SWB.....	2			2	
27	Trk, tractor, 5-ton, 6 x 6 SWB w/wn.....	2			2	
28	Trk, tractor, wkr, 5-ton, 6 x 6 w/wn LWB.....	1			1	
29	Trk, utility, ¼-ton, 4 x 4.....	20	6		9	5
30	Trk, wrk, med, 5-ton, 6 x 6 w/wn.....	1	1			
31	Tractor, wheeled, whse, gas, pneu 4000 13 DBP.....	1	1			
32	Trk, lift, fork, gas, pt 15000-lb cap 153.....	1	1			
33	Total wheeled vehicles.....	92	25		36	31
	TRAILERS					
34	Gen set, gas eng, 3-kw, skid mtd.....	1	1			
35	Gen set, gas eng, 5-kw, skid mtd.....	5	1	1		
36	Gen set, gas eng, .5-kw shock.....	65		16	1	
37	Gen set, gas eng, 1.5-kw, skid mtd.....	4	1		3	
38	Gen set, gas eng, 3-kw, skid mtd.....	2			1	1
39	Gen set, gas eng, tlr mtd, PU-378/G.....	3				3
40	Gen set, gas eng, tlr mtd, PU-456/G.....	1			1	
41	Gen set, gas eng, tlr mtd, PU-290/MG.....	4			4	
42	Gen set, diesel eng, tlr mtd, PU-402/M.....	1			1	
43	Gen set, diesel eng, tlr mtd, PU-551/G.....	2				2

1		2	3	4	5	6
1	Item	Total Amount TOE 31- 105E	TOE 31- 106E HQ & HQ CO	TOE 31- 107E SF Forces Co (4 ea)	TOE 1- 307E Aviation Co	TOE 11- 247E SIG Co
44	Tlr, platform, whse, wood, 6000 lb, PT 2 couplings.....	4	4			
45	Tlr, amph, cargo, 1/4-ton, 2-wheel.....	20	6		9	5
46	Tlr, cargo, 3/4-ton, 2-wheel.....	10	3		6	1
47	Tlr, cargo, 1 1/2-ton, 2-wheel.....	27	3		7	17
48	Tlr, tank, water, 1 1/2-ton, 2-wheel.....	7	4		2	1
49	Semitlr, van, cargo, 6-ton, wheel.....	2			2	
50	Total trailers.....	158	23	17	37	30
MAJOR VEHICULAR EQUIPMENT						
51	Repair shop, Sig C, trk Mtd, 2 1/2-ton, 6 x 6.....	2			2	
52	Central O, tty, AN/MGC-9.....	1				1
53	Comm opr cen, AN/MS-C-31.....	3	1			2
54	El shop shelter, mtd AN/MSM-16.....	1				1
55	Darkroom, photo, portable, AN/TFQ-7.....	2			1	1
56	Operations cen, AN/MS-C-32.....	3				3
57	Terminal teleg, AN/MS-C-29.....	1				1
58	Cont cen msg, OA-3986/TSC-26, mtd, 2 1/2-ton.....	2				2
59	Receiver gp, A-3984/TSC-26, mtd, 2 1/2-ton.....	2				2
60	Transmitter gp, OA-3985/TSC-26, mtd, 2 1/2-ton.....	2				2
	Total major vehicular equipment.....	19	1		3	15



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CHAPTER 2 PERSONNEL

Section I. GENERAL

2-1. General

This chapter provides unclassified personnel data for staff officers on division, corps, field army, theater army logistical command and subordinate logistical commands, and theater staffs within a theater of operations. (For classified data, see FM 101-10-3, ch. 2.)

a. Section I outlines the contents of the chapter.

b. Section II enables the staff officers to estimate losses and the requirements for replacements in—

- (1) Combat zone forces of division size or greater, both for short periods of a particular type of combat action and for longer periods containing a variety of types of action.
- (2) Forces in the communications zone.
- (3) Theaters of operation. Two methods of varying accuracy are given. In each case, loss estimates are given for

the unit concerned as a whole with breakdowns by branch of service.

For classified data pertaining to estimation of losses and requirements for replacements in a theater of operations where the enemy employs nuclear weapons, see FM 101-10-3, chapter 2, section II.

c. Section III gives a basis for estimates of prisoners of war by giving experience data under varying conditions of World War II.

d. Section IV gives a basis for estimates of decorations and mail by giving experience data from World War II and the Korean War.

e. Section V gives a basis for estimates of chaplain positions and planning factors for chaplain ecclesiastical items of equipment and supply.

f. Section VI guides the staff officer in making the internal arrangement of division, corps, and field army headquarters.

g. Section VII gives a basis for estimates of crime rates and U.S. military prisoners.

Section II. LOSSES AND REPLACEMENTS¹

2-2. General

A personnel loss is any reduction in the assigned strength of a unit. These losses are caused primarily by enemy action, disease, accidents, and administrative action. The rate of loss varies with the theater of operations, climate, terrain, condition and state of training of troops, type of activity, the enemy, and numerous other factors. Each division and corps has its own loss experience dependent upon its own situation. Loss rates by arm or service and by military occupational specialty within corps and division vary with the

amount of exposure of the particular category of personnel to the various causes of losses.

a. *Categories of Losses.* Personnel losses result from three general categories.

- (1) *Battle losses.* Those losses incurred in action, including:

- (a) Battle casualties (BC).

1. Wounded or injured in action (WIA/IIA).

2. Died of wounds and injuries received in action (DOW/DOI).

- (b) Killed in action (KIA).

¹ Losses and strengths considered herein do not include Air Force personnel.

- (c) Missing in action (MIA) or captured by the enemy (CAP).
- (2) *Nonbattle losses.* Those losses not directly attributable to being in action, regardless of when sustained, including—
 - (a) Nonbattle dead (NBD).
 - (b) Nonbattle accident/injury (NBA/NBI).
 - (c) Nonbattle missing (NBM).
 - (d) Sick/Disease (S/D).
- (3) *Administrative losses.* Those losses including—
 - (a) Transfers out of the unit.
 - (b) Absent without leave.
 - (c) Desertion.
 - (d) Rotational personnel.
 - (e) Discharges.

b. Gross Losses. In addition to those killed, captured, or missing, gross losses include those evacuated to hospitals and dropped from the rolls of their units. In division, corps, and field army units, any man evacuated to a hospital is dropped from unit rolls and carried on the rolls of the Department of the Army Medical Holding Detachment and is not chargeable against the authorized theater strength. In the theater army logistical command, men are dropped from unit rolls after they remain in hospitals over 90 days or when it is foreseen that they will be hospitalized in excess of 90 days.

c. Net Losses. Net losses are gross losses less those returned to duty within the theater. Net losses are computed only at theater level and are used as a basis for estimates of personnel required from the continental United States (CONUS) to maintain theater strength.

d. Loss Experience.

- (1) Factors and figures which appear in the tables of this section are based primarily upon World War II and the Korean War experience and will not apply necessarily during another war. For future planning, loss experience of past wars must be modified by evaluating new factors applicable to new conditions. As a war progresses, every echelon of command gradually builds

up loss experience which more accurately reflects the current conditions. *It is emphasized that even the most complete and accurate figures relating to past wars should not be relied upon as valid for any future war.* With past experience as a basis, good judgment and sound knowledge of principles must be used to develop new experience tables applicable to new conditions. Administrative losses are based on changing policies and, *except for the confinement rates for military prisoners*, are not adaptable to the establishment of loss tables based on past experience. For this reason, experience tables for administrative losses, *other than losses to confinement*, are not included in this manual. *Experience tables for losses to confinement are contained in section VII of this chapter.*

- (2) Since the disease rate makes up a large part of the nonbattle loss rate, the overall loss rate has seasonal variations and depends upon the region in which the force is operating. Accidents are the most frequent cause of all nonbattle losses.

2-3. Nuclear Loss Estimates

a. General. The use of nuclear weapons by the enemy against U.S. forces will result in increased battle losses. Battle losses from nuclear weapons may be divided into two general categories:

- (1) Battle losses sustained when a military unit is destroyed. The magnitude of such losses is so great that replacements with individuals is not feasible. Replacements for these battle losses will be provided for by unit replacement.
- (2) Battle losses sustained by units which are on the periphery of the area of damage. Replacements for battle losses in this category will be provided from survivors of destroyed units and by personnel in the individual replacement system.

b. Factors Influencing Losses. No valid experience data exists from which loss experience tables can be copied. The problem of estimating the number of replacements (both unit and individual) required to replace losses to nuclear weapons contains many variable factors. Among the more important of these factors are—

- (1) Frequency of enemy employment of nuclear weapons.
- (2) Types and yields of weapons employed.
- (3) Types of targets selected for nuclear weapon attack.
- (4) Effectiveness of enemy target location system.
- (5) Accuracy of enemy delivery means.
- (6) Protective measures adopted by own forces.

c. Effect of Nuclear Attack. Nuclear attack on CONUS with the attendant damage, contamination, and fallout introduces new elements which will affect the magnitude of disease and nonbattle injury rates among survivors. A preliminary gross estimate which may be used in planning for nuclear warfare, indicates that a multiplying factor of 2.8 should be applied to the nonbattle admission rate as shown for CONUS.

d. Estimation of Battle Losses. Effective battle loss estimation requires an aggressive effort on the part of all agencies, particularly intelligence agencies, to provide specific data to eliminate the variable factors outlined in *b* above or to permit reasonable assumptions to be made concerning these variable factors. The validity of battle loss estimation will be directly proportional to the degree of refinement which can be made in these factors. For classified information pertaining to nuclear battle losses under conditions of nuclear warfare, see FM 101-10-3, chapter 2, section II.

2-4. Unit Replacements

Each theater army will be authorized separate units to be employed as replacements for units which may be rendered ineffective for

any reason. The numbers and types of units furnished will be determined by the Department of the Army, based upon the recommendations of the theater commander (para. 2-3).

2-5. Combat Zone Estimates

a. General. The procedures and data contained in this paragraph are applicable to the estimation of nonnuclear losses. Because of the possible magnitude of nuclear battle losses and the effect which such losses may have on tactical operations, nuclear battle losses should be estimated separately. See FM 101-10-3, chapter 2, Section II.

b. Purpose of Estimate. Personnel loss estimates at corps and division levels are used to anticipate the effect of losses on the tactical plan for the handling of replacements within the commands. The estimates must answer three questions—the strength at any given time, the losses to be anticipated for a specific situation, and the distribution of these losses by arm or service and military occupational specialty. Combat estimates are of two types—short-period estimates (5 days or less) and long-period estimates (over 5 days). Estimates at field army level are used for the same purposes as at corps and division levels. In addition, they are used as a basis for allocation of available replacements and to inform higher headquarters of anticipated replacement requirements. Field army and corps headquarters use both short-period estimates and long-period estimates. Divisions normally use only short-period estimates.

c. Factors. In calculating losses, there are two major factors to be considered:

- (1) Loss rates applicable to the specific situations are expressed as percentage of strength or as number per thousand of average strength of any given period. In compilation and use of loss data, units whose loss rates are about the same because of similar operating conditions are grouped together.
- (2) Loss rates are applied to the strength of the particular command under consideration. There are two different strengths used—

(a) *Authorized strength* is table of organization and equipment (TOE) strength plus any additional personnel authorized by higher headquarters. Authorized strength is used in long-range planning and when the assigned strength is unknown or rapidly fluctuating.

(b) *Assigned strength* includes all personnel carried as assigned on the unit's roster. Assigned strength is used, when known, in long-period estimates if it differs materially from authorized strength and if it will remain reasonably stable during the estimated period.

d. *Short-Period Estimates (Periods Not in Excess of 5 days).*

(1) *Daily personnel losses as percentage of strength.* (Do not use this table for loss-estimate periods over 5 days.)

	1	2	3	4	5	6	7	8	9	10
1	General type of operations for the force as a whole	Division in contact			Divisions in corps and field army reserve			Nondivisional units, corps, and field army ¹		
		Battle loss (percentage)	Nonbattle loss (percentage)	Total percentage	Battle loss (percentage)	Nonbattle loss (percentage)	Total percentage	Battle loss (percentage)	Nonbattle loss (percentage)	Total percentage
2	Covering and security force action ----	0.9	0.3	1.2	0.3	0.3	0.6	0.3	0.1	0.4
	Attack:									
3	Meeting engagement -----	2.4	0.3	2.7	0.3	0.3	0.6	0.4	0.1	0.5
4	Of a position—1st day -----	3.8	0.3	4.1	0.4	0.3	0.7	0.5	0.1	0.6
5	Succeeding days -----	1.9	0.3	2.2	0.3	0.3	0.6	0.4	0.1	0.5
6	Of a fortified zone—1st day -----	6.3	0.3	6.6	0.5	0.3	0.8	0.7	0.1	0.8
7	Succeeding days -----	3.2	0.3	3.5	0.4	0.3	0.7	0.5	0.1	0.6
	Defense:									
8	Meeting engagement -----	1.5	0.3	1.8	0.3	0.3	0.6	0.3	0.1	0.4
9	Of a position—1st day -----	1.9	0.3	2.2	0.3	0.3	0.6	0.4	0.1	0.5
10	Succeeding days -----	1.0	0.3	1.3	0.3	0.3	0.6	0.3	0.1	0.4
11	Of a zone—1st day -----	3.2	0.3	3.5	0.4	0.3	0.7	0.5	0.1	0.6
12	Succeeding days -----	1.6	0.3	1.9	0.3	0.3	0.6	0.4	0.1	0.5
13	Inactive situations ² -----	0.7	0.3	1.0	0.3	0.3	0.6	0.3	0.1	0.4
14	Pursuit -----	1.3	0.3	1.6	0.3	0.3	0.6	0.3	0.1	0.4
15	Retirement and delayed action -----	0.7	0.3	1.0	0.3	0.3	0.6	0.3	0.1	0.4

¹ Use divisional loss rates for units attached to a division.

² Forces in contact—neither side attacking.

(2) *Distribution of battle losses by branch (divisions).*

	1	2	3	4
1	Branch	Infantry division (percentage)	Armored division (percentage)	Airborne division (percentage)
2	Infantry ----	93.0	62.0	85.6
3	Artillery ----	2.4	3.6	6.9
4	Armor ----	2.0	23.1	0.0
5	Engineers ----	1.5	3.3	3.9
6	All others ----	1.1	8.0	3.6

(3) *Distribution of infantry battle losses by selected military occupational specialty within an infantry division.* The combat effectiveness of an infantry division is most seriously affected by the personnel losses of its combat maneuver battalions. A total of 87.4 percent of the infantry battle losses occurs among riflemen and weapons crewmen (and closely allied specialists), who constitute the larger portion of the infantry division assault battalions strength.

(4) *Distribution of nonbattle losses.* Nonbattle losses in each branch are in the same proportion to the total nonbattle losses as the strength of that branch is to the total strength of the unit.

(5) *Example.* Calculate the total non-nuclear losses of an infantry division in the first 3 days of the defense of a position and determine the number of infantry riflemen and weapons crewmen who become battle losses.

(a) *Total losses.*

Authorized strength of division (TOE)	15,606
Assigned strength of division (assumed), beginning of first day	15,341
Losses, first day, defense of position (2.2% x 15,341—(1) above, line 9, col 4)	338
Assigned strength, end of first day	15,003
Losses, second day, defense of position (1.3% x 15,003—(1) above, line 10, col 4)	195
Assigned strength, end of second day	14,808
Losses, third day, defense of position (1.3% x 14,808—(1) above, line 10, col 4)	193
Assigned strength, end of third day	14,615
Total losses, 3 days (338+195+193)	726

(b) *Battle losses.*

First day, defense of position (1.9% x 15,341—(1) above, line 9, col 2)	291
Third day, defense of position (1.0% x 14,808—(1) above, line 10, col 2)	148
Total battle losses	589

(c) *Infantry battle losses.*

Infantry battle losses (93% x 589—(2) above, line 2, col 2) ..	548
Infantry riflemen and weapons crewmen battle losses (87.4% x 548—(3) above)	479

e. *Long-Period Estimates — Combat Zone (periods in excess of 5 days).*

(1) *Monthly personnel losses.*

(a) The percentages given in the following tables are average figures for all theaters in World War II.

	1	2	3
	Troops	Battle losses percentage per month	Nonbattle losses percentage per month
1			
2	Infantry divisions in combat zone	10.00	8
3	Armored divisions in combat zone	8.00	7
4	Corps and field army non-divisional troops in combat zone	1.25	3

(b) The percentages given in the following table are based upon average Korean War experience 25 June 1950 to 25 July 1953.

Infantry Divisions						
	1	2	3	4		
1	Type of operation	Battle losses per division per day	Battle losses per division—percentage per month ¹	Status distribution—percentage		
				Killed	Wounded	Missing
2	Offensive:					
3	Against main enemy force	67	11.2	14.6	83.2	2.3
4	Against delaying force:					
5	Organized	26	4.3	18.2	69.6	12.2
6	Partly disorganized	12	2.0	18.8	75.9	5.3
7	Against fortified hill positions	34	5.7	17.5	79.4	3.1
8	Defensive:					
9	Against main enemy force	77	12.8	25.2	68.8	6.2
10	Main pressure on non-U.S. units	35	5.8	16.1	70.6	13.2
11	Withdrawal	119	19.8	15.2	44.5	40.2
12	Positional warfare	6	1.0	18.6	75.0	6.4

¹ Based upon assumed average divisional strength of 18,000.

(2) *Types of battle losses as percentage of total battle losses.*

	1	2	3	4
1	Battle losses	Infantry divisions percentage	Armored divisions percentage	Corps and field army nondivisional units (percentage)
2	Killed.....	16.5	18.0	16.0
3	Wounded.....	70.0	72.0	84.0
4	Captured and missing.....	13.5	10.0	Negligible

(3) *Distribution of losses by branch within divisions. See d(2) and (4) above.*(4) *Distribution of battle losses by branch within corps and larger units in the combat zone as percentage of total battle losses.*

	1	2	3
1	Branch	Percentage	
		World War II	Korea War
2	Infantry.....	81.9	81.1
3	Artillery.....	4.5	5.7
	Field.....	(3.6)	
	Air defense.....	(0.9)	
4	Armor.....	6.6	5.3
5	Corps of Engineers.....	3.2	7.9
6	Army Medical Service.....	2.8	
7	Signal Corps.....	0.2	
8	Quartermaster Corps.....	0.1	
9	Ordnance Corps.....	0.2	
10	Transportation Corps.....	---	
11	Chemical Corps.....	0.3	
12	Military Police Corp.....	0.1	
13	Miscellaneous.....	0.1	

Note. The percentage figures given in the World War II portion of this table are the field battle loss distribution as reported through data processing unit channels, European Theater of Operations, for the period 6 June 1944 through 31 March 1945. The figure for armor combines the percentages originally reported as armored forces (2.9 percent), tank destroyer (1.4 percent), and cavalry (2.3 percent). In actual operations, the distribution of battle losses by branch varies with the composition of the force, type of operation, etc.

(5) *Distribution of nonbattle losses. See d(4) above.*(6) *Example. Calculate the number of replacements required to bring 1st*

Corps up to authorized strength and to maintain it as that strength in combat for 15 days, assuming no nuclear losses, given—

	Authorized strength	Assigned strength
Three infantry divisions	46,818	44,780
One armored division ..	16,350	15,604
Corps nondivisional troops	39,972	38,322
Total corps ..	103,140	98,706

(a) *Replacements needed now.*

Authorized (103,140)—	
assigned (98,706)	4,434

(b) *Estimated losses, 15 days.*

Infantry divisions ((1) above, line 2):	
Battle losses $\frac{1}{2} \times 10\% \times 46,818$	2,341
Nonbattle losses $\frac{1}{2} \times 8\% \times 46,818$	1,873
One armored division ((1) above, line 3):	
Battle losses $\frac{1}{2} \times 8\% \times 16,350$	654
Nonbattle losses $\frac{1}{2} \times 7\% \times 16,350$	572
Corps nondivisional troops ((1) above, line 4):	
Battle losses $\frac{1}{2} \times 1.25\% \times 39,972$	250
Nonbattle losses $\frac{1}{2} \times 3.0\% \times 39,972$	600
Total losses for 15 days	6,290

(c) *Total replacements required.*

Replacements needed now....	4,434
Losses for 15-day period....	6,290
Total	10,724

f. *Special Estimates for Airborne Operations.*

- (1) Personnel losses for forces conducting an airborne assault operation or an air-landed operation may be estimated by applying the applicable daily loss rates from the following table to the assigned strength of units actually committed to the operation.

Note. Rates in this table are for planning purposes only. The rates for each airborne operation are different. The rates in this table are useful as a guide or for use in practicing estimate procedures.

	1	2	3	4	5	6	7
1	Type of operation and type of forces committed	First day (includes en route and in airhead) (percentage)			Succeeding days ¹ (percentage)		
		Nonbattle loss	Battle loss	Total	Nonbattle loss	Battle loss	Total
	Airborne assault operation:						
	Airborne or infantry division and attached troops:						
2	Assault echelon (parachute and/or assault aircraft) ²	0.3	9.3	9.6	0.3	2.0	2.3
3	Followup echelon.....	0.3	2.5	2.8	0.3	2.0	2.3
4	Corps troops.....	0.3	1.5	1.8	0.3	1.0	1.3
	Air-landed operation (inside secured airhead):						
5	Airborne or infantry division and attached troops (to include replacements committed to combat upon arrival) ³	0.3	4.3	4.6	0.3	2.0	2.3
6	Corps troops.....	0.3	1.5	1.8	0.3	1.0	1.3

¹ Upon linkup or when forces in the objective area are firmly established, rates and methods given in d or e above for an infantry division are applicable.

² For planning purposes and in the absence of experience factors, casualty figures for air-landed assault forces are assumed to be the same as for parachute assault forces.

³ If not committed to combat, assess losses as for corps troops.

- (2) *Example:* Calculate the number of nonnuclear losses which will be sustained by the 102d Airborne Division on D-day and D+1. Take-off times and H-hour are on D-day. Computations for followup echelon are omitted from this example. Strength of the division (13,398) is echeloned as follows:¹

Assault echelon	Strength
Followup echelon	11,858
Rear echelon	469
	1,071

Airhead—first day:

Assault echelon (11,858 x 0.096)	1,138
--	-------

Airhead—second day:

Assault echelon (11,858 — 1,138) x 0.023	246
Total losses D-day and D+1 (976 + 211)	1,384

¹ Division strength is based on TOE 57E Airborne Division Base and 9 Airborne infantry maneuver battalions.

g. Special Estimates for Amphibious Operations.

- (1) Nonnuclear personnel losses for amphibious forces establishing a beachhead may be estimated by applying the applicable daily loss rates from the following table to the *assigned* strength of units actually committed in the beachhead or en route thereto.

Note. Rates in this table are for planning purposes only. The rates for each amphibious operation are different. The rates in this table are for use as a guide only or in practicing estimate procedures.

- (2) The amount and type of reinforcement required by divisions making amphibious landings will be different for each operation because of the necessity to tailor the force to fit the mission, area of operations, lift available, and the enemy situation.
- (3) *Example.* Calculate the total number of nonnuclear losses which will be sustained during an amphibious opera-

	1	2	3	4	5	6	7	8	9
1		Phase I—Forces en route		Phase II—Forces in beachhead					
		Daily at sea ¹	Landing	First day			Succeeding days ²		
		Nonbattle and battle loss (percentage)	Battle loss (percentage)	Nonbattle loss (percentage)	Battle loss (percentage)	Total ³ (percentage)	Nonbattle loss (percentage)	Battle loss (percentage)	Total (percentage)
2	Assault forces: ⁴								
3	Divisions and attached troops	0.5	1.3	0.3	5.3	5.6	0.3	1.5	1.8
4	Corps and field army troops	0.5	1.0	0.3	3.0	3.3	0.3	1.0	1.3
5	Followup forces: ⁵								
6	Divisions and attached troops	0.5	0.5				0.3	1.5	1.8
7	Corps and field army troops	0.5	0.5				0.3	1.0	1.3

¹ Rates in this column include both battle and nonbattle losses en route and are distributed by arm or service in the same proportion to the total losses as the strength of each arm or service is to the strength of the total force being transported.

² After beachhead is secure and forces are building up for the breakout (phase III), the rates and methods given in d(1) or e(1) above are applicable. The rates in this table are applicable only until the beachhead is firmly established.

³ Losses are distributed as given in d(4) above for nonbattle losses; d(2) or e(4) above for battle losses by arm or service; d(2) above for battle losses by category (killed, wounded, captured, and missing).

⁴ Assault forces in this table are those units who make their landings in the face of enemy opposition at or near the beachhead. For purposes of computing total division rates, it is assumed an assault division lands one brigade by helicopter behind the beaches and one brigade over the beaches, followed by the reserve brigade and the remainder of the division.

⁵ Followup forces in this table include those landing over beaches secured by other friendly forces.

tion by 1st Corps on D -1, D-day, and D +1.

	Assigned Strength
1st Infantry Division	15,606
2d Infantry Division	15,606
3d Infantry Division	15,606
Nondivisional troops, assault echelon	22,632
Nondivisional troops, followup echelon	36,415
Total 1st Corps	105,865

Total 1st Corps will sail at assigned strength. On D-day the 1st and 2d Infantry Divisions will assault the beach in a helicopter and waterborne assault. 3d Infantry Division and nondivisional troops in followup echelon will land on D+1.

D-1:

(a) *Losses at sea.*

1. Assault divisions.
31,212 x 0.5% ((1) above, col 2, line 2) 156
2. Nondivisional assault troops.
22,632 x 0.5% ((1) above, col. 2, line 3) 113
3. *Following division.*
15,606 x 0.5% ((1) above, col 2, line 4) 78

4. Nondivisional followup troops.

36,415 x 0.5% ((1) above, col 2, line 5) 182

5. Total 1st Corps D-1 losses 529

D-day:

(b) *Assault landing.*

1. Assault divisions.

31,212-156 x 1.3% ((1) above, col 3, line 2) 404

2. Nondivisional assault troops.

22,632-113 x 1.0% ((1) above, col 3, line 3) 225

(c) *Nonbattle losses.*

1. Assault divisions.

31,212-156-404 x 0.3% ((1) above, col 4, line 2) 92

2. Nondivisional assault troops.

22,632-113-225 x 0.3% ((1) above, col 4, line 3) 67

(d) *Battle losses.*

1. Assault divisions.

31,212-156-404 x 5.3% ((1) above, col 5, line 2) 1,624

2. Nondivisional assault troops.

22,632-113-225 x 3.0% ((1) above, col 5, line 3) 669

(e) *Losses at sea.*

1. Followup division.

15,606-78 x 0.5% ((1) above, col 2, line 4) 78

2. Nondivisional followup troops.
36,415-182 x 0.5% ((1) above, col
2, line 5) ----- 181
- (f) *Total 1st Corps D-day losses.*
(b) + (c) + (d) + (e) ----- 3,340
- D+1:
- (g) *Landing losses.*
1. Followup division.
15,606-78-78 x 0.5% ((1) above, col
3, line 4) ----- 77
2. Nondivisional followup troops.
36,415-182-181 x 0.5% ((1) above,
col 3, line 5) ----- 180

- (h) *Beachhead losses.*
1. Assault divisions.
31,212-156-404-92-1, 624 x 1.8%
((1) above, col 9, line 2) ----- 521
2. Nondivisional assault troops.
22,632-113-225-67-669 x 1.3% ((1)
above, col 9, line 3) ----- 280
3. Followup division.
15,606-78-78-77 x 1.8% ((1)
above, col 9, line 4) ----- 277
4. Nondivisional followup troops.
36,415-182-180 x 1.3% ((1) above,
col 9, line 5) ----- 466
- (i) *Total 1st Corps D + 1 losses.*
(g) + (h) ----- 1,801

(4) *Worksheet form—personnel loss estimates—amphibious operations.*

	1	2	3	4	5	6	7	8	9	10
		D-1			D-day			D+1		
		Rate (per- centage)	Strength	Losses	Rate (per- centage)	Strength	Losses	Rate per- centage)	Strength	Losses
1	Phase I—force at sea:									
2	Assault divisions.....	0.5	31,212	156						
3	Nondivisional assault troops.....	0.5	22,632	113						
4	Followup division.....	0.5	15,606	78	0.5	15,606	78			
5	Nondivisional followup troops.....	0.5	36,415	182	0.5	36,415	181			
6	Landing:									
7	Assault divisions.....				1.3	31,212	404			
8	Nondivisional assault troops.....				1.0	22,632	225			
9	Followup division.....							0.5	15,606	77
10	Nondivisional followup troops.....							0.5	36,415	180
	Total—Phase I.....			529			887			257
11	Phase II—forces in beachhead:									
12	Assault divisions:									
13	Nonbattle losses.....				0.3	31,212	92	1.8	28,936	521
14	Battle losses.....				5.3	31,212	1624			
15	Nondivisional assault troops:									
16	Nonbattle losses.....				0.3	22,294	67	1.3	21,558	280
17	Battle losses.....				3.0	22,294	669			
18	Followup division.....							1.8	15,373	277
19	Nondivisional followup troops.....							1.3	35,872	466
20	Total—Phase II.....						3,340			1,801

2-6. Communications Zone Estimates

a. In estimating the nonnuclear gross losses for all ground troops in the communications zone, battle losses are considered negligible, and nonbattle losses are calculated at 0.5 percent per month. Army or service distribution of nonbattle losses is determined by applying this nonbattle loss percentage to the strength of each arm or service in the command considered.

b. Before estimates of losses to nuclear weapons can be made, certain information on enemy capabilities must be secured (para 2-3). If specific information cannot be obtained, appropriate assumptions must be made. By applying target analysis methods to selected critical target areas a basis for estimating nuclear losses can be evolved. (See FM 101-10-3, ch. 2, sec. III.)

2-7. Theater Estimates—Nonnuclear

(See FM 101-10-3, ch. 2, sec. II, for theater estimates—nuclear.)

a. *General.* The following tables are based on U.S. Army experience in World War II in all theaters. Approximately 6½ percent of the losses were officers. In specific areas, the distribution of battle losses by arm or service varies with the composition of the theater, types of operations, etc. The table shown for gross losses, with each category of loss expressed as percent of strength per month, represents a gross loss estimate in a particular situation where it is expected that the battle loss experience will approximate that of the European Theater in World War II. Other

situational gross loss estimates could be constructed using the experience factors shown below in b(3) and converting the rates to percent per month by the method given in b(2)(c) below.

(1) Gross losses.

	1	2
1	Type of loss	Percentage of total theater strength by month
2	Nonbattle losses -----	4.32
3	Battle losses -----	1.59
4	Killed -----	(0.27)
5	Wounded -----	(1.14)
6	Captured and missing -----	(0.18)

(2) Distribution of battle casualties by type and branch.

	1	2	3	4	5	6
1	Branch	Percentage of branch's battle losses by type				
		Killed	Wounded	Missing	Captured	Total
2	Infantry -----	17.3	71.2	2.8	8.7	100.0
3	Artillery -----	14.3	61.6	3.1	21.0	100.0
	Field -----	(15.7)	(68.0)	(2.7)	(13.6)	(100.0)
	Air defense -----	(10.5)	(43.8)	(4.1)	(41.6)	(100.0)
4	Armor -----	19.0	70.8	1.7	8.5	100.0
5	Corps of Engineers -----	18.8	66.9	2.6	11.7	100.0
6	Army Medical Service -----	15.3	66.4	2.9	15.4	100.0
7	Signal Corps -----	17.2	55.5	4.5	22.8	100.0
8	Quartermaster Corps -----	18.6	42.9	6.6	31.9	100.0
9	Ordnance Corps -----	16.1	43.4	5.7	34.8	100.0
10	Transportation Corps -----	24.1	69.2	5.9	0.8	100.0
11	Chemical Corps -----	22.7	65.3	1.3	10.7	100.0
12	Military Police Corps -----	18.1	71.6	1.3	9.0	100.0
13	Miscellaneous -----	18.8	36.8	13.6	30.8	100.0
14	Total -----	17.2	69.8	2.8	10.2	100.0

b. Estimation of Losses.

(1) *First method.* Gross losses may be estimated by the following method, which is more accurate than (2) below because of frequent changes in organization within a theater.

(a) Determine battle losses and nonbattle losses of combat zone troops (para 2-5).

1. Divisional.
2. Nondivisional.

(b) Determine nonbattle accident/injury of troops in the communications zone (para 2-6).

(c) Add (a) and (b) above.

(2) *Second method.* In a well established theater, at theater army level, losses may be estimated by the following formula:

(a) $R + S + T = \text{losses per month.}$
 $R = \text{the daily rate of gross loss.}$

	1	2	3	4	5	6
1	Branch	Percentage of branch's battle losses by type				
		Killed	Wounded	Missing	Captured	Total
2	Infantry.....	80.9	82.0	79.5	68.5	80.5
3	Artillery.....	5.9	6.3	7.6	14.6	7.1
	Field.....	(4.8)	(5.1)	(4.9)	(6.9)	(5.2)
	Air defense.....	(1.1)	(1.2)	(2.7)	(7.7)	(1.9)
4	Armor.....	3.8	3.6	2.1	2.9	3.5
5	Corps of Engineers.....	4.0	3.5	3.3	4.2	3.6
6	Army Medical Service.....	2.6	2.8	2.9	4.4	2.9
7	Signal Corps.....	0.5	0.4	0.8	1.1	0.5
8	Quartermaster Corps.....	0.6	0.4	1.4	1.8	0.6
9	Ordnance Corps.....	0.4	0.2	0.8	1.4	0.4
10	Transportation Corps.....	0.2	0.1	0.3	0.0	0.1
11	Chemical Corps.....	0.6	0.4	0.2	0.4	0.4
12	Military Police Corps.....	0.2	0.2	0.1	0.1	0.2
13	Miscellaneous.....	0.3	0.1	1.0	0.6	0.2
	Total.....	100.0	100.0	100.0	100.0	100.0

Note. Percentages for armor are composite figures grouping cavalry and armored forces operations.

(This is expressed as number per thousand theater army strength. It may be for total losses or for any one of the specific categories of loss; i.e., killed in action (KIA), captured or missing in action (MIA), wounded in action (WIA), or injured in action (IIA).

S = theater army strength in thousands.

T = 30-day net loss or return-to-duty factor, based on a gross loss rate of one of the specified type occurring on each day of operation. (For gross loss computation, T is 30—the number of days, since the accumulation overtime is not affected by returns to duty, evacuation, etc.)

(b) The formula in (a) above may be used to compute gross losses, net losses, or returns to duty, depending upon the T factors utilized.

(c) Losses in numbers per thousand strength per day may be converted to percentages per month by multiplying by 30 and dividing by 10 (net factor of 3).

(3) *R factors.* The R factors shown in the following table are based on World War II and Korean War experience. These factors are average daily rates per thousand theater army strength. *The planner may use loss rates based on a future situation, or on past experience, or he may modify the experience (R) factors given here to meet an expected situation.*

	1	2	3	4	5	6
1	Experience	KIA	Captured or MIA	WIA ¹	Disease and nonbattle injuries ¹	Total
	World War II:					
2	All theaters ..	0.05	0.04	0.20	1.14	1.43
3	ETO	0.09	0.06	0.80	0.80	1.33
4	MTO	0.06	0.04	0.25	1.62	1.97
5	Pacific	0.03	0.03	0.11	1.44	1.61
	Korean War:					
6	FECOM	0.05	0.03	0.22	0.72	1.02
7	Korea	0.08	0.05	0.34	0.73	1.20

¹ Based on admissions to hospital.

(4) *S factors.* As stated in (2) (a) above, S factors are always theater army

strength in thousands. The most accurate figures available should be used. When actual assigned strengths are known or can be accurately predicted, they should be used. When actual strengths are not known or cannot be predicted, then authorized strengths should be used.

(5) *T factors.*

- (a) The *T factors* shown in the table in (g) below are based on one of each type of loss occurring each day of operation, beginning with first day of period of estimate and shown for succeeding 30-day intervals of periods of estimate.
- (b) *T factors for gross loss estimates* are derived by multiplying the occurrence of *one* each day by the number of days in the period of estimate. This, of course, always results in factors equal to the number of days in the period of estimate. Therefore, it is not necessary to show these factors separately in a table of *T factors*.
- (c) *The return to duty from captured and missing status* are approximated by assuming that 30 percent of the personnel losses in this category during any given month are recovered for duty within the theater during the same month. Returns to duty from captured and missing status in succeeding months are indeterminable and should be disregarded in making estimates.
- (d) *T factors for monthly returns to duty within the theater from hospitals* are based on the cumulative percentage of daily returns to duty among each day's hospital admissions. *For example*, under a 30-day evacuation policy, 32.12 percent of each single day's battle injury and wound hospital admissions can be returned to duty within the time limit prescribed by the evacuation

policy. However, at the end of 1 month of operations, 32.12 percent of only the first day's admissions have returned to duty; 31.12 percent of the second day's admissions; 30.14 percent of the third day's admissions, etc., depending upon the number of days of hospitalization that are included between the day of admission (in relation to the day of operation) and the number of days in the period of estimate. The *T factors* for monthly returns to duty, as shown in (g) below, and the percentages returned to duty during the month of admission and succeeding months (depending upon the length of the evacuation) are both derived in this manner. The basic data from which these figures are constructed are as follows:

Cumulative Returns to Duty From Hospital By Type of Patient Cumulative percentages returned to duty among admissions to hospital on any 1 day of operation.

1	2	3
Complete hospital days	Wounded injury in action	Sick disease and nonbattle accident injury
1-----	0.00	0.00
2-----	0.89	2.60
3-----	1.83	7.33
4-----	3.11	13.41
5-----	4.54	20.17
6-----	6.04	26.87
7-----	7.53	33.05
8-----	8.85	38.88
9-----	10.15	44.18
10-----	11.39	48.64
11-----	12.37	51.77
12-----	13.34	55.37
13-----	14.30	57.35
14-----	15.45	59.95
15-----	16.52	62.36
16-----	17.66	64.72
17-----	18.69	66.63
18-----	19.78	68.24
19-----	20.99	69.65
20-----	22.07	71.35
21-----	23.19	72.72
22-----	24.18	74.04

1	2	3
Complete hospital days	Wounded injury in action	Sick disease and nonbattle accident/injury
23.....	25.18	75.24
24.....	26.16	76.35
25.....	27.32	77.41
26.....	28.19	78.55
27.....	29.14	79.34
28.....	30.14	80.25
29.....	31.12	80.93
30.....	32.12	82.55
31.....	33.11	83.13
32.....	34.10	83.52
33.....	35.01	84.08
34.....	36.09	84.34
35.....	36.97	84.78
36.....	37.89	85.11
37.....	38.90	85.42
38.....	39.79	85.78
39.....	40.58	86.19
40.....	41.49	86.67
41.....	42.40	86.89
42.....	43.19	87.08
43.....	44.09	87.26
44.....	44.88	87.54
45.....	45.67	87.82
46.....	46.46	88.19
47.....	47.27	88.24
48.....	48.05	88.44
49.....	48.88	88.87
50.....	49.56	89.01
51.....	50.35	89.11
52.....	51.05	89.26
53.....	51.64	89.40
54.....	52.36	89.63
55.....	53.03	89.75
56.....	53.64	89.92
57.....	54.22	90.13
58.....	54.83	90.21
59.....	55.53	90.33
60.....	56.05	90.59
61.....	56.55	90.70
62.....	57.15	90.73
63.....	57.64	90.82
64.....	58.22	90.95
65.....	58.71	91.04
66.....	59.19	91.15
67.....	59.63	91.27
68.....	60.03	91.43
69.....	60.53	91.54
70.....	61.00	91.72
71.....	61.41	91.81
72.....	61.82	91.90
73.....	62.28	92.00
74.....	62.68	92.03
75.....	63.04	92.06
76.....	63.47	92.21

1	2	3
Complete hospital days	Wounded injury in action	Sick disease and nonbattle accident/injury
77.....	63.79	92.30
78.....	64.19	92.41
79.....	64.57	92.51
80.....	64.89	92.58
81.....	65.15	92.69
82.....	65.47	92.78
83.....	65.87	92.88
84.....	66.17	92.96
85.....	66.51	93.04
86.....	66.85	93.10
87.....	67.14	93.23
88.....	67.49	93.32
89.....	67.80	93.35
90.....	68.11	93.39
91.....	68.39	93.45
92.....	68.69	93.57
93.....	68.98	93.69
94.....	69.22	93.77
95.....	69.50	93.84
96.....	69.70	93.92
97.....	69.99	93.96
98.....	70.24	94.01
99.....	70.48	94.06
100.....	70.70	94.10
101.....	70.93	94.20
102.....	71.16	94.23
103.....	71.36	94.27
104.....	71.61	94.31
105.....	71.83	94.36
106.....	72.05	94.40
107.....	72.24	94.45
108.....	72.44	94.48
109.....	72.64	94.50
110.....	72.87	94.54
111.....	73.03	94.66
112.....	73.20	94.70
113.....	73.41	94.74
114.....	73.57	94.79
115.....	73.70	94.85
116.....	73.89	94.89
117.....	74.04	94.93
118.....	74.17	95.01
119.....	74.37	95.04
120.....	74.55	95.08

(e) *Limited assignment personnel.* Of the personnel who return to duty within the theater from hospitals, the following percentages are limited assignment:

1. Under 30-day or 60-day evacuation policies:

	1	Cumulative								Monthly					
		2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Type of loss	30 days	60 days	90 days	120 days	150 days	180 days	360 days	1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	151-180 days	331-360 days
2	Killed in action-----	30.00	60.00	90.00	120.00	150.00	180.00	360.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
3	Captured and missing:														
	a. Net loss-----	21.00	42.00	63.00	84.00	105.00	126.00	252.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00
	b. Return to duty-----	9.00	18.00	27.00	36.00	45.00	54.00	108.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00

1. 120-day evacuation policy.

4	Wounded/injured in action:														
	a. Net loss-----	24.98	41.31	52.44	60.91	68.54	76.17	121.95	24.98	16.33	11.13	8.47	7.63	7.63	7.63
	b. Return to duty-----	5.02	18.69	37.56	59.09	81.46	103.83	238.05	5.02	13.67	18.87	21.43	22.37	22.37	22.37
5	Sick/disease and nonbattle accident/injury:														
	a. Net loss-----	13.60	17.33	19.69	21.38	22.86	24.34	33.22	13.60	3.73	2.36	1.69	1.48	1.48	1.48
	b. Return to duty-----	16.40	42.67	70.31	98.62	127.14	155.66	326.78	16.40	26.27	27.64	28.31	28.52	28.52	28.52

2. 90-day evacuation policy.

4	Wounded/injured in action:														
	a. Net loss-----	24.98	41.31	52.44	62.01	71.58	81.15	138.57	24.98	16.33	11.13	9.57	9.57	9.57	9.57
	b. Return to duty-----	5.02	18.69	37.56	57.99	78.42	98.85	221.43	5.02	13.67	18.87	20.43	20.43	20.43	20.43
5	Sick/disease and nonbattle accident/injury:														
	a. Net loss-----	13.60	17.33	19.69	21.67	23.65	25.63	37.51	13.60	3.73	2.36	1.98	1.98	1.98	1.98
	b. Return to duty-----	16.40	42.67	70.31	98.33	126.35	154.37	322.49	16.40	26.27	27.64	28.02	28.02	28.02	28.02

3. 60-day evacuation policy.

4	Wounded/injured in action:														
	a. Net loss-----	24.98	41.31	54.50	67.69	80.88	94.07	173.21	24.98	16.33	13.19	13.19	13.19	13.19	13.19
	b. Return to duty-----	5.02	18.69	35.50	52.31	69.12	85.93	186.79	5.02	13.67	16.81	16.81	16.81	16.81	16.81
5	Sick/disease and nonbattle accident/injury:														
	a. Net loss-----	13.60	17.33	20.15	22.97	25.79	28.61	45.53	13.60	3.73	2.82	2.82	2.82	2.82	2.82
	b. Return to duty-----	16.40	42.67	69.85	97.03	124.21	151.39	314.47	16.40	26.27	27.18	27.18	27.18	27.18	27.18

4. 30-day evacuation policy.

4	Wounded/injury in action:														
	a. Net loss-----	24.98	45.34	65.70	86.06	106.42	126.78	248.94	24.98	20.36	20.36	20.36	20.36	20.36	20.36
	b. Return to duty-----	5.02	14.66	24.30	33.94	43.58	53.22	111.06	5.02	9.64	9.64	9.64	9.64	9.64	9.64
5	Sick/disease and nonbattle accident/injury:														
	a. Net loss-----	13.60	18.83	24.06	29.29	34.52	39.75	71.13	13.60	5.23	5.23	5.23	5.23	5.23	5.23
	b. Return to duty-----	16.40	41.17	65.94	90.71	115.48	140.25	288.87	16.40	24.77	24.77	24.77	24.77	24.77	24.77

- (a) 8 percent of battle losses.
 - (b) 5 percent of the nonbattle accident/injury.
2. Under 90-day or 120-day evacuation policies:
- (a) 28.6 percent of the battle losses.
 - (b) 5.3 percent of the nonbattle accident/injury.
- (f) *T factors for monthly net losses* are determined by subtracting the returns to duty corresponding to the evacuation policy considered from the gross losses. The sum of the returns to duty and net losses for any month, therefore, must always equal 30.
- (g) *T factors for use in computing theater net losses and returns to duty* are included in the following table. It will be noted that the respective monthly factor is constant after a number of days equal to the length of the evacuation policy considered *plus 30 days*. For example, under a 30-day evacuation policy, the monthly factors are the same from the second month (60 days) and for each succeeding month thereafter, under a 60-day evacuation policy, the monthly factors are the same beginning with the third month (90 days); under a 90-day evacuation policy, they are the same beginning with the fourth month (120 days), etc. Therefore, cumulative factors for 30-day intervals may be determined for any period of estimate beyond the length of the evacuation policy by adding the required number of constant factors to the cumulative figure shown for the period equal to the length of the evacuation policy.
- (6) *Computations.* To obtain *gross losses*, the planner first multiplies the respective expected daily rate of loss per thousand strength (R) by the theater army strength (in thousands) (S) to obtain the respective number of gross losses each day. This number is then

multiplied by the number of days in the period of estimate (T) to obtain the gross losses for the entire period of estimate. When the gross losses, regardless of type, are desired, it is necessary only to multiply the sum of the respective R factors by the strength (S) and length of period of estimate (T). However, *net losses* and *returns to duty* must be computed separately for each type of casualty, using the respective R and T factors applicable to the type of loss and to the *evacuation policy considered*. Examples of the estimation of losses for the next 60 days by the formula $R \times S \times T$ for a theater with an Army strength of 500,000, a 60-day evacuation policy, and theater daily rates of 0.07 for KIA, 0.06 for captured or MIA, 0.24 for WIA, and 0.80 for D&NBI, are given below. (The battle casualty rates are variations of the ETO and MTO rates and D&NBI is the ETO rate in World War II, as shown in (3) above.)

(a) *Gross losses.*

Type of loss	Cumulative for 60 days
1. KIA -----	$(0.07 \times 500 \times 60) = 2,100$
Captured or	
MIA -----	$(0.06 \times 500 \times 60) = 1,800$
WIA/IIA -----	$(0.24 \times 500 \times 60) = 7,200$
Sick/disease and nonbattle acci- dent/injury --	$(0.80 \times 500 \times 60) = 24,000$
Total -----	$(1.17 \times 500 \times 60) = 35,100$

Type of loss	Total for each 30 days
2. KIA -----	$(0.07 \times 500 \times 30) = 1,050$
Captured or	
MIA -----	$(0.06 \times 500 \times 30) = 900$
WIA/IIA -----	$(0.24 \times 500 \times 30) = 3,600$
Sick/disease and nonbattle acci- dent/injury --	$(0.80 \times 500 \times 30) = 12,000$
Total -----	$(1.17 \times 500 \times 30) = 17,550$

3. It will be noted that only the last lines of the above two computations are necessary when the gross losses only, regardless of type, are required.

(b) *Returns to duty within the theater.*

Type of loss	Cumulative for 60 days
1. Captured or	
MIA -----	$(0.06 \times 500 \times 18.00) = 540$
WIA/IIA ----	$(0.24 \times 500 \times 18.69) = 2,243$
Sick/disease and nonbattle acci- dent/injury	$(0.80 \times 500 \times 42.67) = 17,068$
Total -----	19,851

Type of loss	First 30 days
2. Captured or	
MIA -----	$(0.06 \times 500 \times 9.00) = 270$
WIA/IIA ----	$(0.24 \times 500 \times 5.02) = 602$
Sick/disease and nonbattle acci- dent/injury	$(0.80 \times 500 \times 16.40) = 6,560$
Total -----	7,432

Type of loss	Second 30 days
3. Captured or	
MIA -----	$(0.06 \times 500 \times 9.00) = 270$
WIA/IIA ----	$(0.24 \times 500 \times 13.67) = 1,641$
Sick/disease and nonbattle acci- dent/injury	$(0.80 \times 500 \times 26.27) = 10,508$
Total -----	12,419

(c) *Net losses.*

Type of loss	Cumulative for 60 days
1. KIA -----	$(0.07 \times 500 \times 60.00) = 2,100$
Captured or	
MIA -----	$(0.06 \times 500 \times 42.00) = 1,260$
WIA/IIA ----	$(0.24 \times 500 \times 41.31) = 4,957$
Sick/disease and nonbattle acci- dent/injury	$(0.80 \times 500 \times 17.33) = 6,932$
Total -----	15,249

Type of loss	First 30 days
2. KIA -----	$(0.07 \times 500 \times 30.00) = 1,050$
Captured or	
MIA -----	$(0.06 \times 500 \times 21.00) = 630$
WIA/IIA ----	$(0.24 \times 500 \times 24.98) = 2,998$
Sick/disease and nonbattle acci- dent/injury	$(0.80 \times 500 \times 13.60) = 5,440$
Total -----	10,118

Type of loss	Second 30 days
3. KIA -----	$(0.07 \times 500 \times 30.00) = 1,050$
Captured or	
MIA -----	$(0.06 \times 500 \times 21.00) = 630$
WIA/IIA ----	$(0.24 \times 500 \times 16.33) = 1,959$
Sick/disease and nonbattle acci- dent/injury	$(0.80 \times 500 \times 3.73) = 1,492$
Total -----	5,131

(7) In addition to the losses enumerated in (3), (5)(g), and (6) above, certain additional patients are treated on an excused-from-duty basis and, unless later evacuated to hospitals, are not dropped from the rolls of their units. These patients are classified as *quarters cases* and usually are treated at aid stations or collecting stations, in the division clearing company, or in some other medical treatment facility forward of hospitals. Although the majority of these patients are excused from duty for comparatively short periods of time, nevertheless, the planner should be aware of their potential loss under certain conditions where retention in forward elements may either be impracticable or undesirable.

(a) For estimation purposes, about one-third of sick/disease and nonbattle accident/injury admissions to all medical treatment facilities and about one-tenth of battle injury and wound admissions may be expected to remain under treatment in medical treatment facilities forward of hospitals *if there is no interference with the primary mission* of reception, treatment, and evacuation of casualties.

(b) Factors which may be applied to the number of *gross losses* based on hospital admissions, separately for wounded in action patients and for sick/disease and nonbattle accident/injury patients, to derive the expected number of quarters cases are as follows:

1. Wounded or injured in
action ----- 0.1111.
2. Disease and nonbattle ac-
cident/injury ----- 0.4925.

(c) Basic data showing the cumulative percentage returned to duty each day among admissions to quarters on any 1 day of operation are as follows:

1	2	3
Complete quarters (days)	Cumulative percentage return to duty	
	WIA/IIA	Sick/disease and nonbattle accident/injury
1	0.00	0.00
2	20.92	20.83
3	41.35	48.08
4	57.36	68.77
5	66.97	80.84
6	73.73	88.35
7	77.50	92.06
8	79.85	94.62
9	81.91	96.05
10	83.07	96.99
11	84.97	97.32
12	86.11	97.96
13	87.25	98.52
14	88.39	98.86
15	89.46	99.09

1	2	3
Complete quarters (days)	Cumulative percentage return to duty	
	WIA/IIA	Sick/disease and nonbattle accident/injury
16	90.24	99.21
17	91.02	99.33
18	91.59	99.44
19	92.09	99.53
20	92.52	99.61
21	92.88	99.68
22	93.17	99.75
23	93.46	99.81
24	93.67	99.86
25	93.81	99.89
26	93.88	99.91
27	93.95	99.93
28	94.02	99.94
29	94.02	99.95
30 and over	94.09	99.95

(d) Based on the above data, T factors for use in computing net losses and returns to duty for quarters cases are included in the following table:

Cumulative					Monthly			
1	2	3	4	5	6	7	8	9
Type of quarters case and disposition	30 days	60 days	90 days	180 days	1-30 days	31-60 days	61-90 days	151-180 days

1. 30-day or longer evacuation policy.

2	Wounded or injured in action:								
	a. Net loss.....	5.86	7.63	9.40	14.71	5.86	1.77	1.77	1.77
	b. Return to duty.....	24.14	52.37	80.60	165.29	24.14	28.23	28.23	28.23
3	Sick/disease and nonbattle accident/injury:								
	a. Net loss.....	3.26	3.28	3.30	3.36	3.26	0.02	0.02	0.02
	b. Return to duty.....	26.74	56.72	86.70	176.64	26.74	29.98	29.98	29.98

2. 20-day evacuation policy.

2	Wounded or injured in action:								
	a. Net loss.....	5.98	8.23	10.48	17.23	5.98	2.25	2.25	2.25
	b. Return to duty.....	24.02	51.77	79.52	162.77	24.02	27.75	27.75	27.75
3	Sick/disease and nonbattle accident/injury:								
	a. Net loss.....	3.28	3.39	3.50	3.83	3.28	0.11	0.11	0.11
	b. Return to duty.....	26.72	56.51	86.50	176.17	26.72	29.89	29.89	29.89

Cumulative						Monthly			
	1	2	3	4	5	6	7	8	9
1	Type of quarters case and disposition	30 days	60 days	90 days	180 days	1-30 days	31-60 days	61-90 days	151-180 days

3. 15-day evacuation policy.

2	Wounded or injured in action:								
	a. Net loss.....	6.38	9.54	12.70	22.18	6.38	3.16	3.16	3.16
	b. Return to duty.....	23.62	50.46	77.30	157.82	23.62	26.84	26.84	26.84
3	Sick/disease and nonbattle accident/injury:								
	a. Net loss.....	3.35	3.62	3.89	4.70	3.35	0.27	0.27	0.27
	b. Return to duty.....	26.65	56.38	86.11	175.30	26.65	29.73	29.73	29.73

4. 10-day evacuation policy.

2	Wounded or injured in action:								
	a. Net loss.....	7.37	12.18	16.99	31.42	7.37	4.81	4.81	4.81
	b. Return to duty.....	22.63	47.82	73.01	148.58	22.63	25.19	25.19	25.19
3	Sick/disease and nonbattle accident/injury:								
	a. Net loss.....	3.74	4.64	5.54	8.24	3.74	0.90	0.90	0.90
	b. Return to duty.....	26.26	55.36	84.46	171.76	26.26	29.10	29.10	29.10

5. 5-day evacuation policy.

2	Wounded or injured in action:								
	a. Net loss.....	11.39	21.30	31.21	60.94	11.39	9.91	9.91	9.91
	b. Return to duty.....	18.61	38.70	58.79	119.06	18.61	20.09	20.09	20.09
3	Sick/disease and nonbattle accident/injury:								
	a. Net loss.....	7.60	13.34	19.08	36.30	7.60	5.74	5.74	5.74
	b. Return to duty.....	22.40	46.66	70.92	143.70	22.40	24.26	24.26	24.26

(e) Since T factors for quarters cases are based on a daily admission to quarters of *one* patient per day, it is necessary to divide the gross loss numbers ((b) above) by the number of days in the estimate prior to multiplication by T factors for quarters cases.

(8) Assuming that quarters patients cannot be retained on an excused-from-duty basis in forward elements of the command, additional losses (based on data included in (6) above) can be determined as follows:

(a) *Additional gross losses (quarters cases).*

Type of loss	Cumulative for 60 days
1. WIA/IIA	(7,200 x 0.1111) = 800
Sick/disease and nonbattle accident/injury ..	(24,000 x 0.4925) = 11,820
Total	12,620

Type of loss	Total for each 30 days
2. WIA/IIA	(3,600 x 0.1111) = 400
Sick/disease and nonbattle accident/injury ..	(12,000 x 0.4925) = 5,910
Total	6,310

(b) *Returns to duty (quarters cases).*

Type of loss	Cumulative for 60 days
1. WIA-IIA -----	$(800 \div 60 \times 52.37) = 698$
Sick/disease and nonbattle accident/ injury -----	$(11,820 \div 60 \times 56.72) = 11,174$
Total -----	11,872

Type of loss	First 30 days
2. WIA/IIA -----	$(400 \div 30 \times 24.14) = 322$
Sick/disease and nonbattle accident/ injury -----	$(5,910 \div 30 \times 26.74) = 5,260$
Total -----	5,590

Type of loss	Second 30 days
3. WIA/IIA -----	$(400 \div 30 \times 28.23) = 376$
Sick/disease and nonbattle accident/ injury -----	$(5,910 \div 30 \times 29.98) = 5,906$
Total -----	6,282

(c) *Net losses (quarters cases).*

Type of loss	Cumulative for 60 days
1. WIA/IIA -----	$(800 \div 60 \times 7.63) = 102$
Sick/disease and nonbattle accident/ injury -----	$(11,820 \div 60 \times 3.28) = 646$
Total -----	748

Type of loss	First 30 days
2. WIA/IIA -----	$(400 \div 30 \times 5.86) = 78$
Sick/disease and nonbattle accident/ injury -----	$(5,910 \div 30 \times 3.26) = 642$
Total -----	720

Type of loss	Second 30 days
3. WIA/IIA -----	$(400 \div 30 \times 1.77) = 24$
Sick/disease and nonbattle accident/ injury -----	$(5,910 \div 30 \times 0.02) = 4$
Total -----	28

Section III. ENEMY PRISONERS OF WAR AND CIVILIAN INTERNEES**2-8. General**

a. In order that the required resources may be made available and the necessary arrangements may be made for the reception, care, and disposition of enemy prisoners of war and civilian internees, it is necessary to estimate as closely as possible for a given period of time or for a specific operation—

- (1) The number of enemy prisoners of war that will be captured.
- (2) The number of enemy civilians that will be interned.
- (3) The number of enemy prisoners of war that will be retained in the theater of operations.
- (4) The number of enemy prisoners of war that will be evacuated from the theater of operations.

b. Extensive nonnuclear warfare experience factors are available with respect to the capture and evacuation of enemy prisoners of war. Based upon these experience factors, capture and evacuation rates, expressed mainly in terms of averages, have been developed and incorporated in this section. Nevertheless, plan-

ners should bear in mind that prisoners are not characteristically captured at a uniform rate and that the figures cited in this section represent averages which may be greatly altered by such influencing factors as—

- (1) Enemy morale.
- (2) Avenues of withdrawal open to enemy troops.
- (3) Ability of friendly forces to encircle or cut off enemy units.
- (4) Type of operation in which friendly forces are engaged, i.e., attack, defense, retrograde.
- (5) Operational environment.
- (6) Relative strength and sophistication of enemy forces.
- (7) Intensity and effectiveness of ideological indoctrination of enemy troops.
- (8) Intensity and effectiveness of friendly psychological operations.

c. Available experience factors regarding the internment and security of enemy civilians do not permit the development of planning factors as reliable as those for enemy prisoners of war. The number of enemy civilians that

will be interned in specific situations may vary greatly. Planners may, however, develop workable estimates using the factors cited in this section as modified by such considerations as—

- (1) Extent to which enemy civil authorities and agencies work with enemy military forces.
- (2) Intensity and effectiveness of ideological indoctrination of enemy officials and the general populace.
- (3) Intensity and effectiveness of friendly psychological operations aimed at influencing the enemy civil populace.
- (4) Extent to which the enemy populace supports the political and military goals of the enemy government.

2-9. Prisoner-of-War Capture Rates, Nonnuclear Conditions

a. General. The figures and planning factors presented in this paragraph are based primarily on the experiences of U.S. Army forces in World War II and Korea. Of necessity, the experiences represented are those of the kind of organizations, principally divisions, which existed during those two wars. Present day infantry, armored, and airborne divisions are sufficiently similar to their predecessor organizations to render these experience factors still applicable. In the case of the mechanized division which has come into existence since Korea, the figures and factors cited represent interpolations based on the organizational and operational characteristics of the new organization.

b. Division and Corps Estimates. Utilizing the rates set forth below, estimates may be prepared directly for divisions and certain nondivisional units. By combining appropriate estimates developed from these tables, corps capture rates may be developed.

- (1) *Equal force estimates.* When the opposing enemy forces are approximately equal in number and sophistication to U.S. forces, the average number of enemy prisoners of war that may be expected to be captured *per month* can be estimated by using the following percentage factors.

<i>Troops</i>	<i>Percentage of strength</i>
Infantry divisions -----	1.35
Mechanized divisions -----	1.10
Armored divisions -----	0.80
Airborne divisions -----	0.65
Corps and field army nondivisional units:	
Armored cavalry regiments ..	0.85
Separate combat brigades:	
Infantry brigades ----	0.90
Mechanized brigades --	0.75
Armored brigades ----	0.55
Airborne brigades ----	0.45
Other units -----	Negl

- (2) *Unequal force estimates.* For the preparation of estimates by divisions (or comparable task forces) and corps in selected types of tactical operations against a numerically inferior enemy, the figures in the following table may be used. These figures are applicable to all types of divisions, except where otherwise indicated, and are based primarily on the experiences of World War II divisions against veteran enemy troops. In these instances, the U.S. forces were numerically superior by about 2 to 1.

<i>Force and operation</i>	<i>Number of prisoners captured per day</i>
Average per division in all types of operation -----	47
Division in attack of a defensive position -----	50
Division in attack of a defensive position with complete surprise attained -----	700
Division in defense of a position against an unsuccessful enemy attack -----	300
Armored or mechanized division (or task force) in an encirclement operation -----	1000

- c. Theater Estimates.* For overall estimates at theater level under nonnuclear conditions, the factors in the following table may be used. These factors should be used with full awareness of their limitations. They represent averages derived from World War II and Korean experience or interpolated from such experience. Since prisoners are not captured at uniform rates, special preparations must be made for the reception of unusual numbers when

tactical plans contemplate decisive action, such as cutting major routes of withdrawal or driving large enemy forces against an obstacle, or when widespread enemy capitulation is anticipated.

Prisoner-of-War Capture Rates

Organization	Prisoners of war per month			
	Defense	Offense	Enemy Capitulation	
			First Month	Succeeding Month
Infantry division ---	230	3,500	6,000	30,000
Mechanized division -	175	3,550	6,000	30,000
Armored division ---	117	3,600	6,000	30,000
Airborne division ---	155	2,550	6,000	30,000

2-10. Prisoner-of-War Capture Rates, Nuclear Conditions

a. Experience factors which may be used as a basis for estimating prisoner-of-war capture rates under nuclear conditions are lacking. Using target analysis methods, however, enemy casualties can be estimated and approximate determinations made of the number of enemy personnel remaining in the strike area and subject to capture in the exploitation phase.

b. Because of the demoralizing effect produced among enemy troops by the employment of nuclear weapons, an overall increase in the number of enemy prisoners of war captured can be expected. In the absence of more definitive guidance, planners may develop realistic estimates by applying a factor of 2 to the rates set forth in paragraph 2-9.

2-11. Evacuation of Prisoners of War From the Theater of Operations

a. Policies regarding the retention in and evacuation from the theater of operations of enemy prisoners of war are established by the Department of Defense or the Department of the Army to meet the existing situation. These policies are subject to change as the strategic and tactical situations change. It is conceivable that some campaign plans may provide for the retention of all enemy prisoners of war in the active theater; in other situations all or a major proportion of the prisoners of war

may be evacuated from the active theater. The evacuation policies for each major specific campaign are determined early in the planning phases in order that the necessary resources for both retention and evacuation may be made available. The evacuation policy, in all events, must be consistent with the terms of the Geneva Conventions of 1949 and other applicable international agreements.

b. The following table reflects the number of enemy prisoners of war, expressed in terms of division slice, that will normally be retained within the active theater for labor and associated purposes. The figures in this table are based on empirical data derived from past experience, primarily of U.S. forces in Europe during World War II.

<i>Purpose for retention in theater</i>	<i>Number per division</i>
To provide a theater PW labor pool -----	4,000
To provide for PW housekeeping, administration, etc. -----	2,666
Total (division slice) -----	6,666

2-12. Enemy Civilian Internees

a. *Internment.* Broad national policies regarding the internment of enemy civilians are established by the Department of Defense or the Department of the Army. In certain types of limited field operations, such as against an unsophisticated enemy in a counterinsurgency environment, the number of enemy civilians interned may exceed the number of enemy prisoners of war captured. Whenever military operations result in the movement of large numbers of refugees, potential civilian internees will invariably be among the refugees. While no truly dependable internment rates can be established, the following percentage factors may be generally used in preparing estimates until such time as more specific guidance and information become available:

(1) Factors applicable to the local static population—

<i>When the civilian population is—</i>	<i>Percentage of the population interned</i>
Mainly hostile -----	.1 to .5%
Mainly friendly -----	.05 to .1%

- (2) Factors applicable to the estimated number of refugees (estimates derived from these factors should be added to those developed from the application of the factors in ((1) above)—

When the refugees are—	Percentage of the refugees interned
Mainly hostile	2 to 5%
Mainly friendly	.1 to .5%

b. Evacuation. In accordance with the provisions of the Geneva Convention Relative to the Protection of Civilian Persons in Time of War of 12 August 1949, civilian internees are not normally evacuated from the theater of operations but are retained within the occupied territory. Civilian internees will not be evacuated beyond the bounds of the occupied territory except when for material reasons it is impossible to avoid such displacement.

Section IV. PERSONNEL SERVICES

2-13. General

The data presented in paragraphs 2-14 and 2-15 are intended for planning purposes only and do not represent doctrine. The figures have been compiled from the experience of the European Theater of Operations in World War II and the Korean War by averaging the experience of several units over several periods of time. The figures are based on the needs per month of 10,000 troops.

2-14. Decorations

	Approximate average
Distinguished Service Cross	9
Distinguished Service Medal	1
Silver Star	103
Legion of Merit	20
Distinguished Flying Cross	6
Soldier's Medal	7
Bronze Star	565
Heroism	(270)
Meritorious Achievement	(295)
Air Medal	85
Commendation Ribbon	485
Purple Heart	1,175

2-15. MAIL

a. Wartime.

(1) *Surface*

(a) Incoming (to the theater)—

Third- and fourth-class mail	26,650	49,754	155.481
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(b) Outgoing—

Third- and fourth-class mail	1,436	2,675	8.328
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(2) *Air.*

(a) Incoming—

Airmail	265,083	6,165	17.614
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First-class mail	97,450	2,256	6.429
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(b) Outgoing—

Airmail	205,549	4,757	13.591
---------------	---------	-------	--------

First-class mail	54,973	1,270	3.629
------------------------	--------	-------	-------

b. Peacetime.

(1) *Surface.*

(a) Incoming (to the theater)—

First-class mail	199,010	5,763	16.466
------------------------	---------	-------	--------

Other	10,910	43,453	135.791
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(b) Outgoing—

First-class mail	52,250	1,075	3.071
------------------------	--------	-------	-------

Other	12,480	47,926	149.769
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	Pieces	Weight in pounds	MTON of shipping space
(2) Air.			
(a) Incoming—			
Airmail.....	148,183	4,306	12.303
First-class mail.....	82,830	3,765	10.757
Parcel post.....	870	3,187	9.959
(b) Outgoing—			
Airmail.....	261,018	5,118	14.623
First-class mail.....	47,234	1,243	3.551
Parcel post.....	975	3,656	11.425

Section V. CHAPLAIN COMBAT SERVICE SUPPORT

2-16. General

The chaplain branch has no TOE organizations. Religious coverage is provided by chaplains assigned or attached to battalions, groups, brigades, commands and other command and control headquarters. When tailored forces of combat, combat support and combat service support elements are established, chaplains will be provided by the organizations that make up the tailored force and/or from sources available.

2-17. Chaplain Planning Factors

a. Whenever chaplain coverage is provided for a tailored force, personnel planning factors are as follows:

- (1) Chaplain positions will be authorized for tailored units of the field army in the ratio of 1 for 700 troops or major fraction thereof.
- (2) Chaplain positions will be authorized all other tailored units in the ratio of 1 for 850 troops or major fraction thereof.
- (3) Above authorizations exclude chaplain positions for hospitals and convalescent centers. For planning factors for medical units see AR 310-32.
- (4) One primary duty chaplain assistant position is authorized each chaplain position.
- (5) Additional details on planning factors are found in AR 310-32, AR 611-201, and FM 16-5.

b. Chaplain equipment and supply authoriza-

tions are based on appropriate TOE's and TA 50-922 and TA 50-989. Chaplain ecclesiastical items of equipment and supply are classified as nonexpendable and expendable.

- (1) Nonexpendable ecclesiastical items mainly consist of line items authorized in appropriate TOE's as well as items of individual issue in the possession of chaplains. These items normally are carried with the unit chaplain. Table I provides wartime replacement factors for those nonexpendable ecclesiastical items required for combat forces in an active theater.

Table I. Wartime Replacement Factors—Nonexpendable Ecclesiastical Equipment

1	Item	Unit	Lbs	S/T	Replacement factor ¹
2	Altar, portable, aluminum, leg style. 39 in. H, 60 in. L, 24 in. D.	ea	15	.007	.083
3	Chest, hymn book, fibre covered.	ea	15	.007	.083
4	Chaplain Kit, Prot and Cath (20 components).	ea	25	.0125	.042
5	Chaplain Kit, Cath only (43 components).	ea	25	.0125	.042
6	Chaplain Kit, Jewish	ea	25	.0125	.042
7	Flag, distinguishing, chaplain Christian/Jewish.	ea	.25	neg	.083
8	Organ, foot, folding, chaplain.	ea	70	.035	.042

¹ Replacement factor = the average monthly recurring issue demand per using chaplain.

(2) Other nonexpendable ecclesiastical items may be authorized by the theater or force commander based on TA 50-922. Such authorization will be dependent upon such factors as the mission of the combat forces; their relative stability and degree of combat activity; the types of personnel (to include PW's and civilian internees) to receive chaplain support; and the degree of permanent or semi-permanent chapel construction authorized or the religious facilities available.

(3) Expendable items of ecclesiastical supply will be provided in accordance with the number of chaplains and auxiliary chaplains authorized and the number of religious services conducted (to include services conducted for PW's and civilian internees). Authorized peacetime allowances are contained in TA 50-989. Some of these items may be locally procured, depending upon the geographical area. Table II lists those expendable ecclesiastical supplies essential to combat forces in an active theater.

Table II. Combat Essential Expendable Ecclesiastical Supplies

1	Item	Unit	Lbs	S/T	Allowances ¹	BOI
2	Candles, altar, 100% beeswax 24 per box, 8 per pound-----	box	3	.0015	2	Per CH/QTR
3	Fair linen, altar, white cloth, 42 in. L, 14 in. W-----	ea	neg	neg	2	As required per CH
4	Host, communion, 1 1/8 in. dia 125/pkg, 4 pkg/box-----	bx	.5	neg	As req	1 Host per Communicant
5	Host, communion, 2 1/2 in. dia 25 per pkg-----	pkg	.1	neg	As req	As required per using CH
6	Hymn book, song and service hard cover 6 3/4 in. L, 4 7/8 in. W-----	ea	.25	neg	.5	Per mil per in fld unit
7	Religious literature, misc-----	pkg	50	.025	N/A	Per CH/QTR
8	Supplies, kosher, perishable ² -----	case	30	.015	N/A	Per Jewish CH per month
9	Juice, grape, sacramental use, 24 pt botl or cans/case-----	case	36	.018	As req	1 botl or can per 75 communicants.
10	Wine, angelica, white 12 1/2 gal botls/ case-----	case	36	.018	1	Per CH/QTR
11	Wine, kosher, red 12 1/2 gal botls/case-----	case	38	.019	1	Per 24 Jewish personnel/ Passover/Seder. Plus Per/Jewish CH/ QTR.

¹ To these allowances must be added a percentage for breakage, pilferage, spoilage. This percentage will vary depending upon climate, type of handling, and shipping and supply security.

² Transported by air from nearest source of procurement.

Section VI. INTERNAL ARRANGEMENT OF HEADQUARTERS

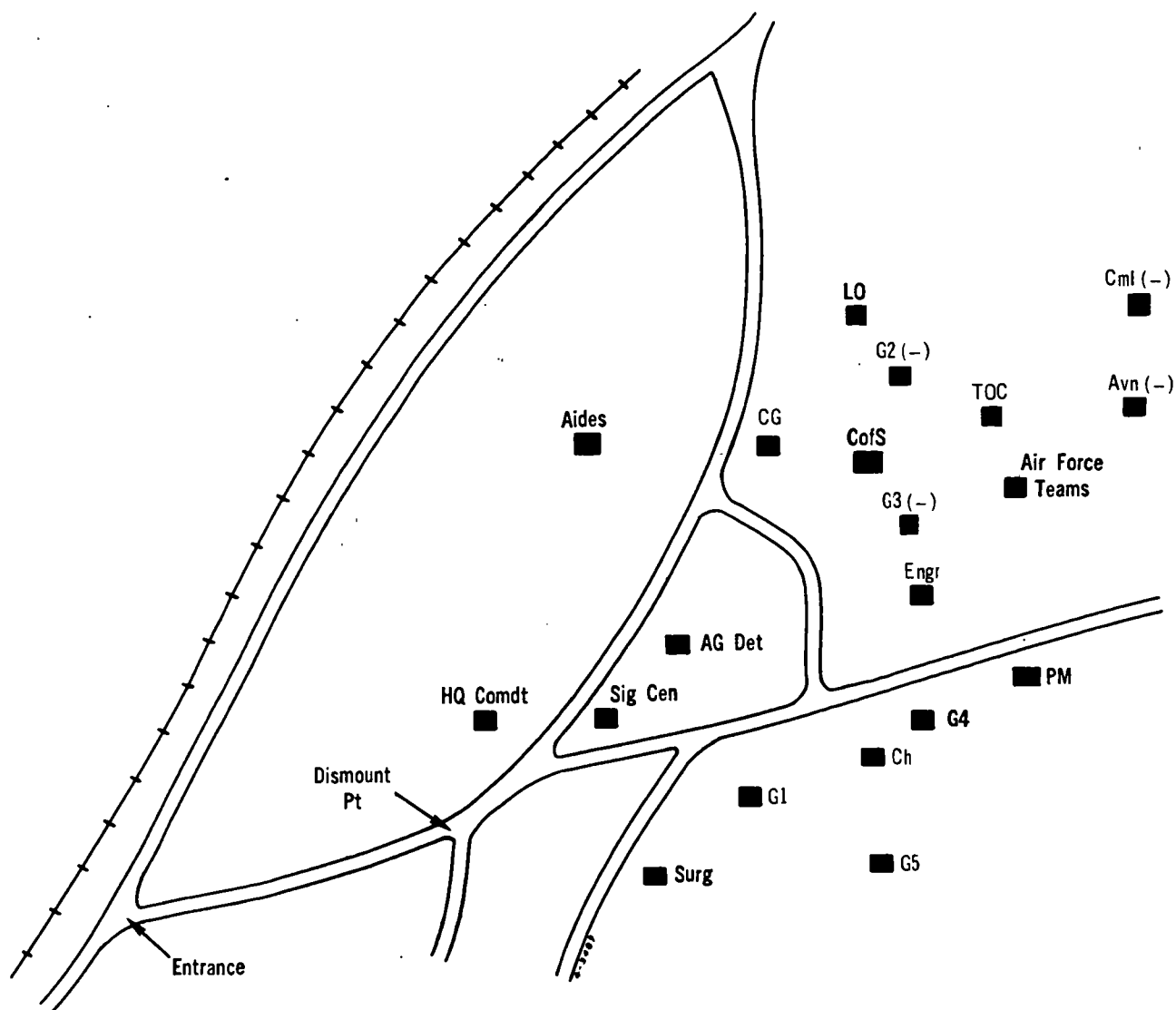
2-18. General

The following diagrams indicate schematic arrangements for field army corps, and division headquarters. The echelons of field army corps,

and division headquarters may be located in buildings. The diagrams which are shown for these headquarters suggested a layout to be followed when they operate under tentage.

2-19. Division Headquarters (Schematic)

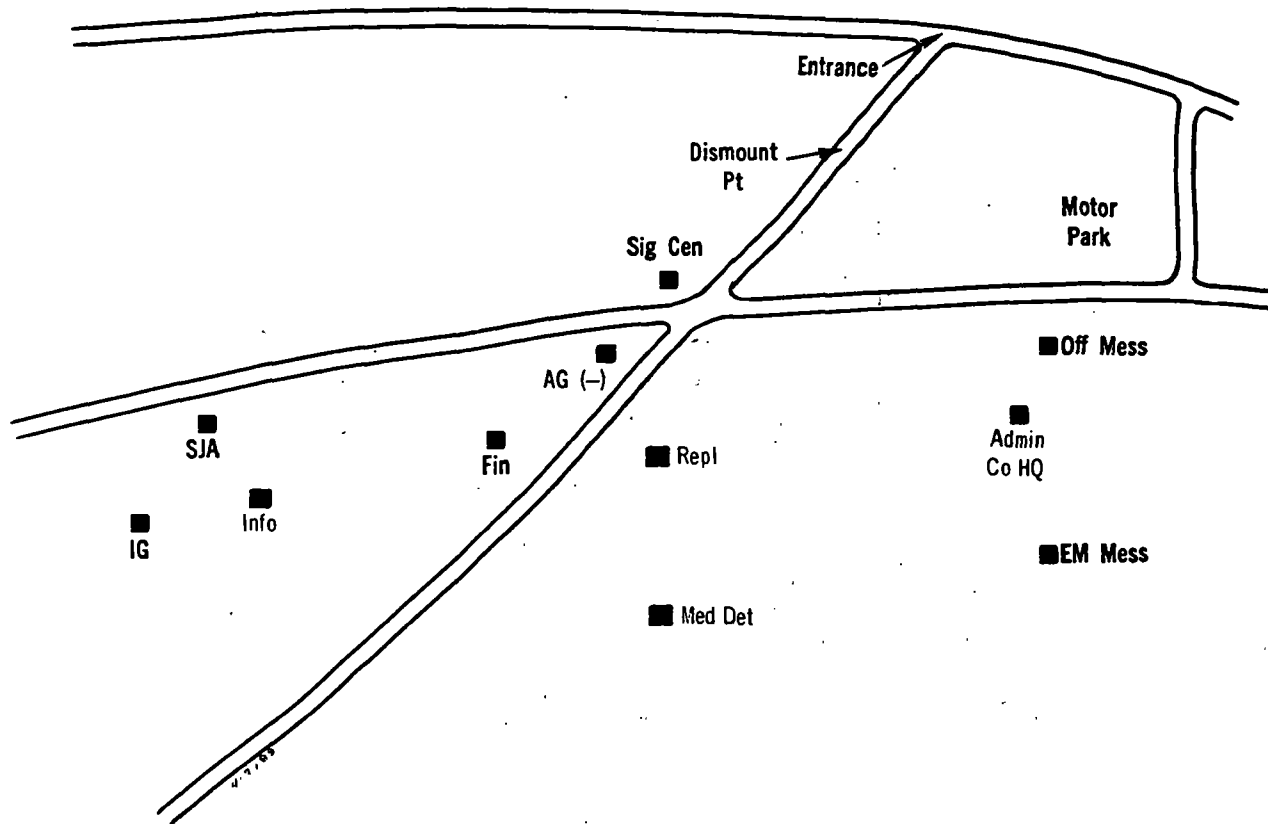
a. *Main Command Post (not to scale) (fig. 2-1).*



- NOTES: 1. In the airborne division, modifications will be effected because of organization and mission.
2. While not part of the main command post, sufficient area also must be provided for a motor park, messes, elements of headquarters company, military police elements, and a helicopter landing zone and/or airstrip.
3. Elements of the main command post may be located in a tactical command post.

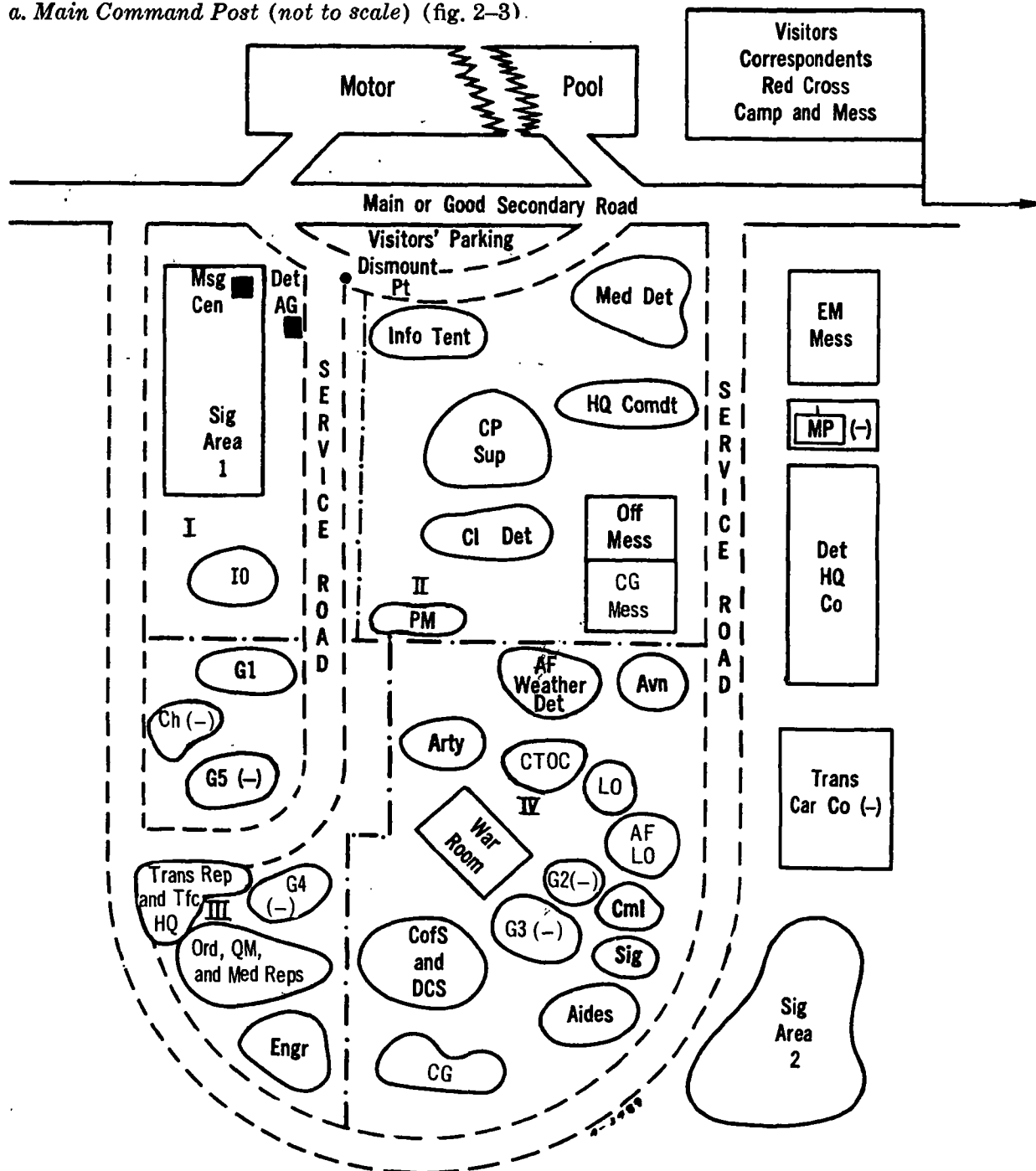
Figure 2-1

b. Rear Command Post (not to scale) (fig. 2-2).



NOTE: Sufficient area must also be provided for a helicopter landing zone and/or airstrip.

Figure 2-2

2-20. Corps Headquarters*a. Main Command Post (not to scale) (fig. 2-3).***Relative locations of sections at corps main command post**

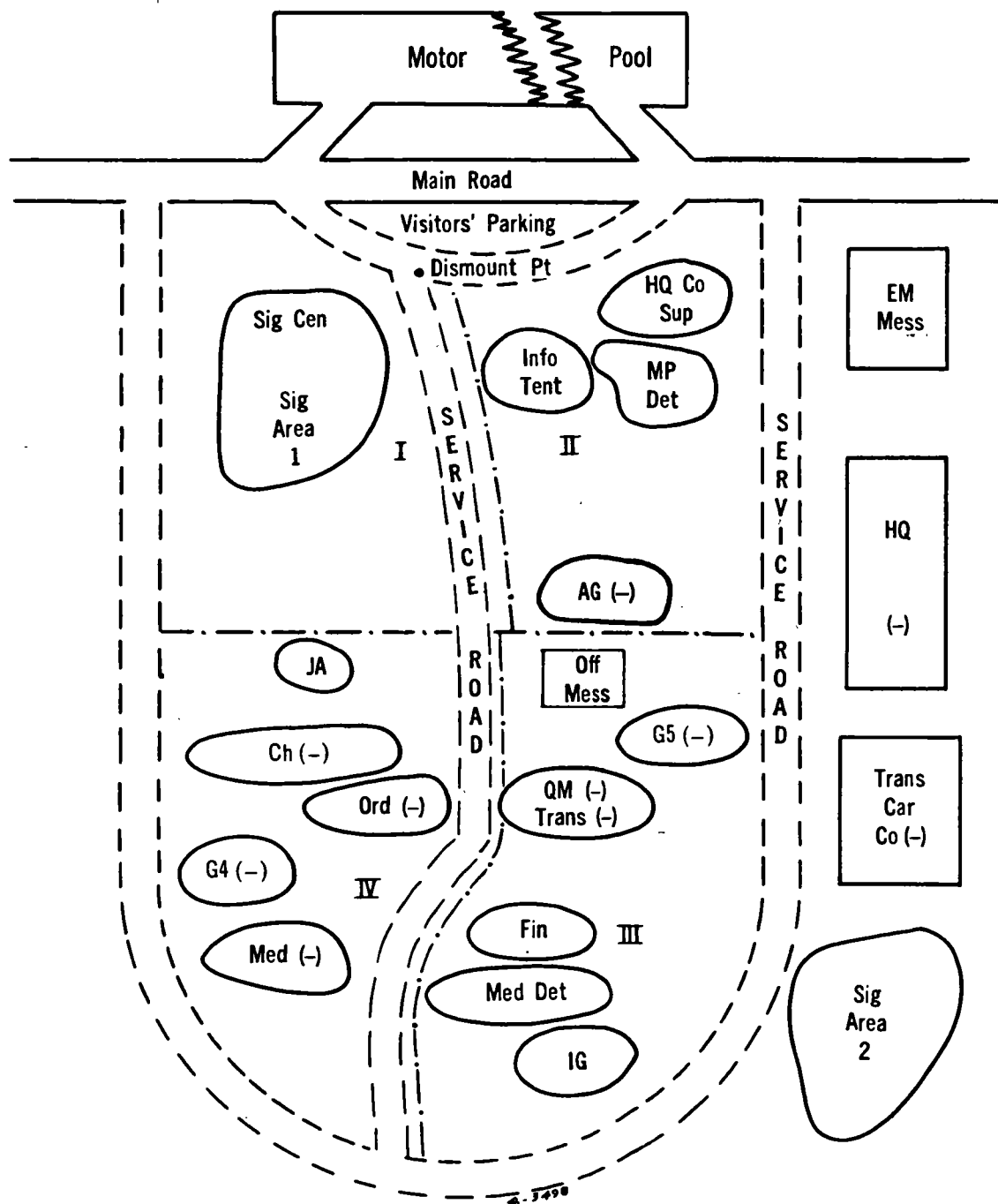
NOTES: 1. Notice that the total area occupied is divided into four areas. Various sections should endeavor to retain their relative positions within their respective areas.

2. While not part of the main command post, sufficient area must also be provided for a helicopter landing zone and/or airstrip.

3. Elements of the main command post may be located in a tactical command post.

Figure 2-3

b. Rear Command Post (not to scale) (fig. 2-4).



Relative locations of sections at corps rear command post

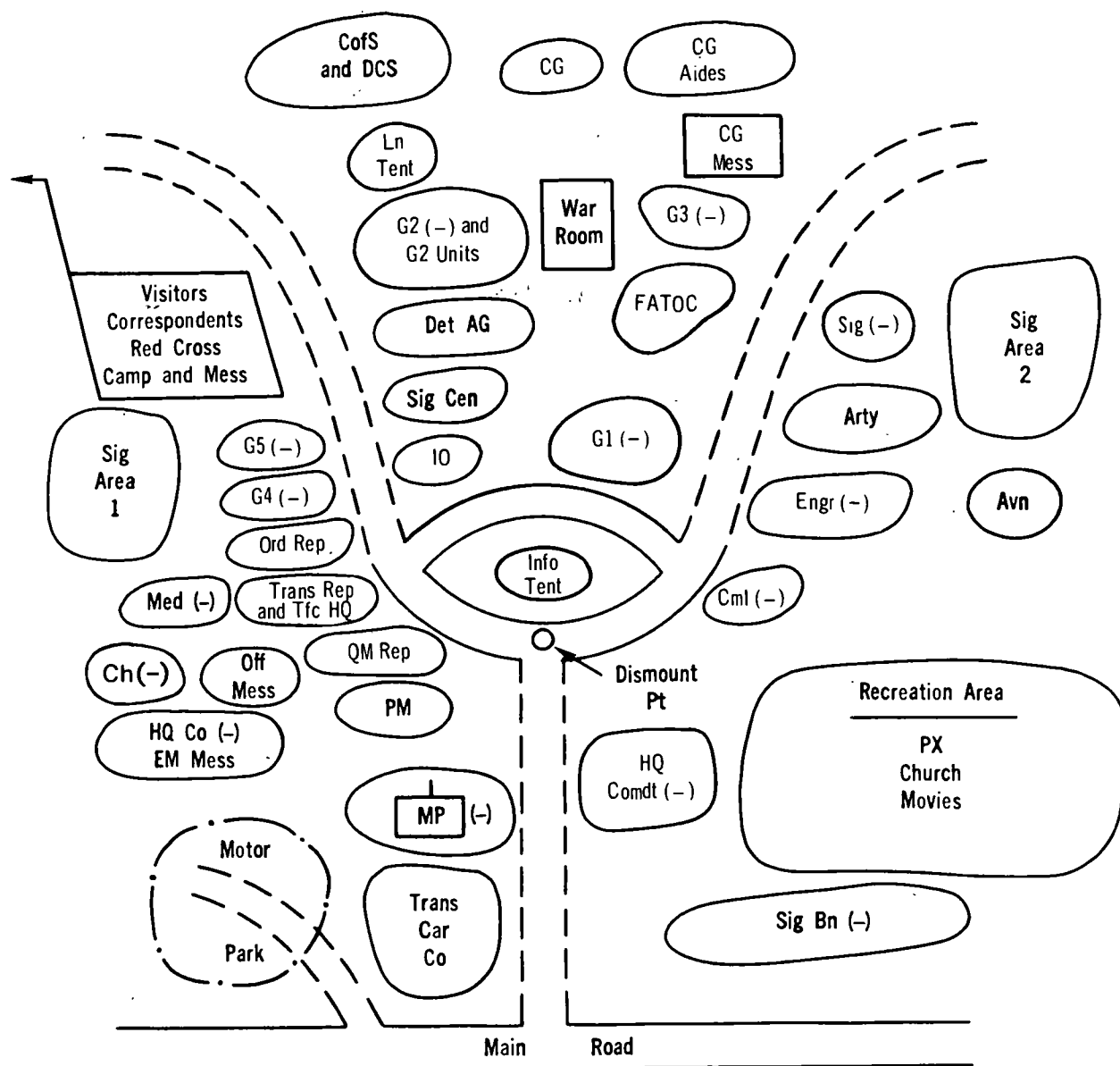
NOTES: 1. Notice that the total area is divided into four areas. Various sections should endeavor to retain their relative positions within their respective areas.

2. Sufficient area must also be provided for a helicopter landing zone and/or airstrip.

Figure 2-4

2-21. Field Army Headquarters

a. Main Command Post (not to scale) (fig. 2-5).

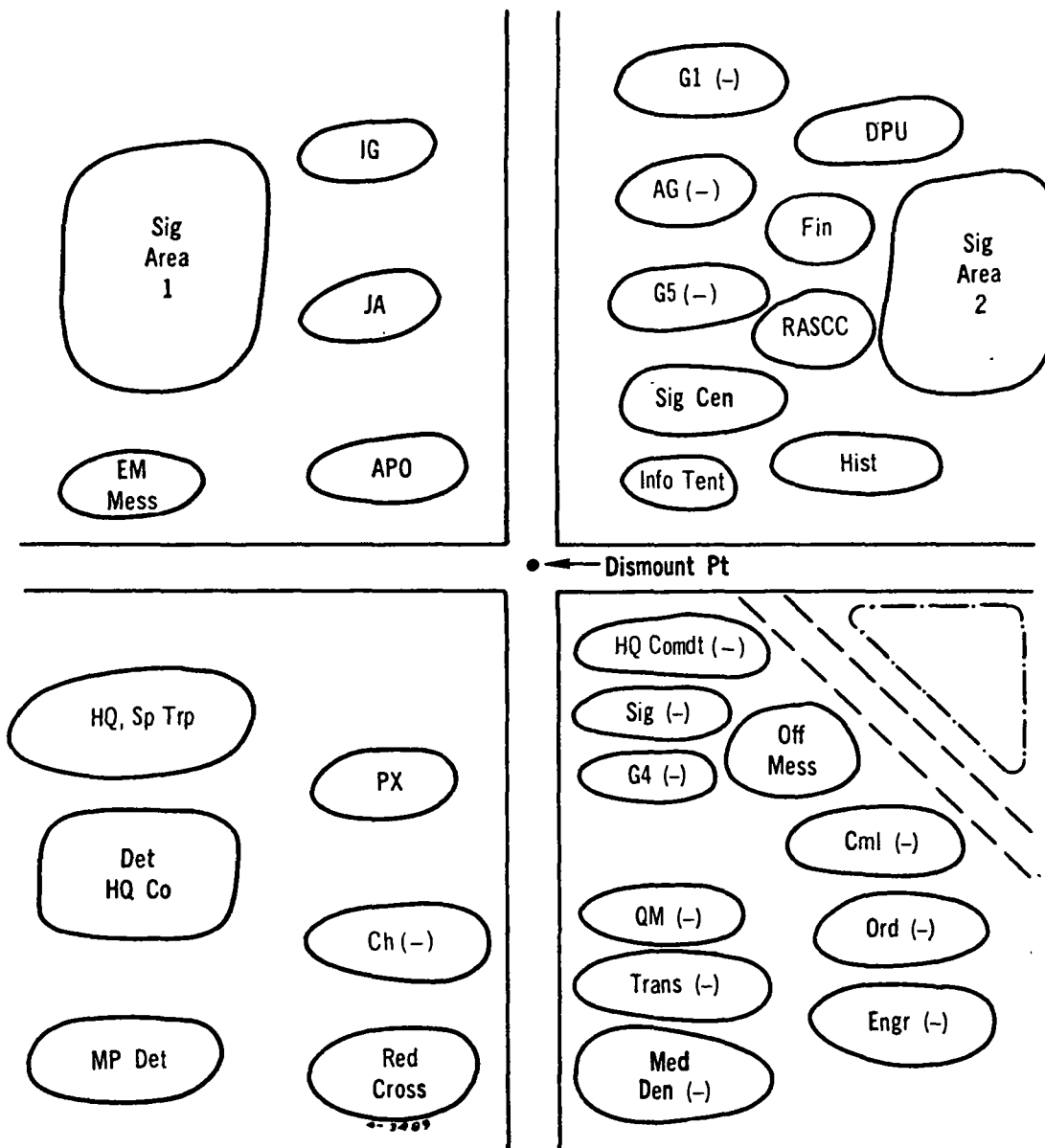


NOTES: 1. While not part of the main command post, sufficient area must also be provided for a helicopter landing zone and/or airstrip.

2. Elements of the main command post may be located in a tactical command post.

Figure 2-5

b. Rear Command Post (not to scale) (fig. 2-6).



NOTE: Sufficient area must also be provided for a helicopter landing zone and/or airstrip.

Figure 2-6

Section VII. CRIME RATES AND MILITARY PRISONERS

2-22. Crime Rates

a. In order that the necessary arrangements may be made for the detection, investigation, and disposition of criminal incidents it is necessary to prepare an advance estimate of the

number of such incidents which will occur within a given span of time in a command. Experience indicates that there will be little variance in the overall crime rate between peacetime and wartime. In a theater of opera-

tions there will be variance between the combat and the communications zones, with the bulk of the serious crimes occurring in the latter.

b. Based on extensive statistical data, covering both peacetime and wartime, the average *annual* crime rate within any command will approximate 13.6 serious crimes per 1000 military population. This planning factor increases in dependability in direct proportion to the size of the command, and in a theater of operations it is best suited for theater level planning.

c. Crime rate planning factors may be used as the basis for determining the personnel requirements for criminal investigators in a command. Experience has shown that one criminal investigator can effectively accomplish an average of 34 criminal investigations per year. Thus, it follows that on the average criminal investigators should be assigned to a command on the basis of one to approximately 2,500 military personnel.

2-23. Military Prisoners

a. *General.* The confinement, care, and disposition of U.S. military prisoners represent command responsibilities which should not be overlooked by planners in preparing for the conduct and support of tactical operations. The number of military prisoners that must be guarded, processed, evacuated, and restored to duty is of direct interest and application to planners in arriving at requirements for transportation, construction, and personnel. The factors and figures set forth in this paragraph are, with respect to nonnuclear conditions, based on extensive statistical data derived from commands of various types and sizes in a wide range of operational environments. These factors may be applied to a command of any size, but will prove most dependable for theater level planning. The factors cited for nuclear conditions represent a general increase over the non-nuclear factors based on the assumption that the employment of nuclear weapons will have

an overall demoralizing effect and will create an increased opportunity for crime; these factors should be used with full awareness of the fact that they are not based on experience and may require extensive alteration in a specific situation.

b. Confinement Rates.

- | | |
|---------------------------|------------------------------|
| (1) Nonnuclear conditions | ---1% of command population |
| (2) Nuclear conditions | ----2% of command population |

c. *Evacuation From and Retention in the Theater of Operations.* Basic policies regarding the evacuation of military prisoners from the theater are established by the Department of Defense or the Department of the Army. These policies may be subject to change depending upon changes in both the strategic and the tactical situation. Normally military prisoners who are not restorable to duty, who have been sentenced to punitive discharge, or who have more than 6 months confinement remaining to be served are evacuated to CONUS. Of all military prisoners confined in the theater of operations, the following factors may be expected to be applicable under both nuclear and non-nuclear conditions when normal evacuation policies have been established:

- | | |
|---|----------|
| (1) Evacuated to CONUS disciplinary barracks | -----34% |
| (2) Retained in theater rehabilitation training centers | -----30% |
| (3) Retained in stockades in the theater | -----36% |

d. *Restoration Rates.* For planning purposes, the following factors regarding the restoration of military prisoners to duty, may be generally applied:

- | | |
|--|-----------|
| (1) From stockades | -----100% |
| (2) From rehabilitation training centers | -----39% |
| (3) From disciplinary barracks | ---7.7% |



CHAPTER 3

INTELLIGENCE—MAPPING AND AERIAL PHOTOGRAPHY

Section I. GENERAL

3-1. Intelligence

The mission of the military intelligence organization is to provide intelligence specialist support to major commanders from division to theater army level to assist in the production of intelligence. The military intelligence organization is composed of trained military intelligence, counterintelligence, and field intelligence personnel, along with necessary administrative and technical personnel. For detailed data concerning organizational concept and intelligence planning, see FM 30-9 and FM 30-9A; FM 101-10-3; and TOE 30-25. Special intelligence units and detachments (military intelligence organization) are presented in paragraph 4.2e(8).

3-2. Mapping and Aerial Photography

Mapping and aerial photography are intelligence items. The following sections in this chapter provide basic data on responsibilities and factors for the estimation of various logistical needs in connection with these items. This information is for general planning only. The specific problem of providing map support for an operation should be coordinated with the engineer of the planning echelon.

3-3. Functions and Responsibilities

Functions and responsibilities with respect to mapping and aerial photography are given in AR 117-5.

Section II. MAPPING

3-4. Types and Scales of Military Maps

a. Types.

- (1) *Planimetric map*. A map which presents the horizontal positions only of the features represented.
- (2) *Topographic map*. A map which presents the horizontal and vertical positions of the features represented.
- (3) *Plastic relief map*. A topographic map printed on plastic and molded into three-dimensional form.
- (4) *Photomap*. A reproduction of a photograph or photomosaic upon which gridlines, marginal data, place names, and boundaries are added and which, in some instances, depicts relief graphically.
- (5) *Plastic relief photomap*. A photomap printed on plastic and molded into three-dimensional form.

- (6) *Military city map*. A large-scale topographic map (usually 1:12,500) of a town or city.
- (7) *Special maps*. Maps designed for a special purpose, such as trafficability maps, transportation maps, boundary maps, etc.
- (8) *Terrain model*. A three-dimensional representation of an area, modeled in plaster, sponge rubber, or other materials. It is distinguished from other map types in that some cultural and terrain features are shown in realistic model form rather than by topographic symbol.
- (9) *Photomosaic*. Assembly of aerial photographs to form a composite picture.

b. Scales.

- (1) *Small-scale military maps* range in scale from 1:600,000 to smaller (1:

1,000,000 is standard). These scales of maps are needed for general planning and for strategical studies by commanders of large units.

- (2) *Medium-scale military maps* range in scale from 1:600,000 to 1:75,000 (1:250,000 is standard). These scales of maps are required for planning operations, including movements and concentrations of troops and supplies. They are used as detailed planning maps, as graphics to illustrate briefings, as bases for medium-scale plastic relief maps, as road maps, and for phases of close air-ground support. When no larger scales are available, they are used as tactical maps and to assist field artillery in fire control.
- (3) *Large-scale military maps* range in scales from 1:75,000 to larger (1:50,000 is standard). These scales of maps are intended to meet the tactical, technical, and administrative needs of field units.

3-5. Requirements for Maps

a. General. To calculate quantities of maps required for an operation, the following must be determined:

- (1) The number of sheets of each map scale (i.e., the area coverage required at each scale). Data must be obtained from map indexes of the area concerned.
- (2) The number of copies of each sheet required for initial issue. Data are in *b* below.
- (3) The number of copies of each sheet required for replenishment issues. Data are in *c* below.
- (4) The total copies of each scale required. This total equals sheets $\times$ initial copies + replenishment.

b. Copies for Initial Issue.

- (1) *Guides for estimating quantities.*
 - (a) *General.* Small- and medium-scale maps (other than road maps) and aeronautical charts are issued in small quantities to headquarters

only. The basis of issue is the unit headquarters, and quantities vary in proportion to the size of the unit. Basic figures are given in table showing headquarters allowances ((*g*) below).

(b) *Large-scale maps.*

1. *General.* Bases used in computing allowances of large-scale maps vary with the type of the unit. The company is the basic unit for computing large-scale map requirements. Headquarters and service companies use the same basis as other companies. Allowances for unit headquarters are given in (*g*) below. In addition, an allowance of one copy per organic Army aircraft is made.
2. *Infantry and combat engineer units.* Allowances for infantry and combat engineer units are on the basis of two copies per platoon.
3. *Infantry (mechanized).* Allowances for mechanized units are computed on the same basis as infantry units plus an additional allowance of one per tank and carriage and two per armored personnel carrier with armament.
4. *Artillery units.* Allowances for headquarters and service batteries are the same as for infantry units. Allowances for firing batteries are on the basis of one per section plus two per forward observer and liaison officer.
5. *Armored units.* Allowances for armored units are computed on the same basis as infantry units plus an additional allowance of one per tank and carriage and two per armored personnel carrier with armament.
6. *Airborne units.* Allowances for airborne units are the same as for equivalent ground troops.
7. *Other units.* Map requirements for other units are on the basis of one

- per officer and one per reconnaissance noncommissioned officer.
- (c) *Road maps.* Road maps are issued one per vehicle and in limited quantities to unit headquarters.
- (d) *Aeronautical charts.* In addition to the headquarters allowances, aeronautical charts are issued on a basis of two per organic Army aircraft.
- (e) *Photomaps.* Photomaps are issued as substitutes for large-scale maps when the latter are not available. When necessary as supplement to topographic maps, photomaps are issued in quantities not exceeding those authorized for topographic maps.
- (f) *Hydrographic charts.* Hydrographic charts are issued to units and headquarters as required by the situation and the mission of the unit.
- (g) *Headquarters.* In addition to the guides stated above, the quantities shown in the following table are the number of copies of each sheet needed by unit headquarters:

Headquarters Allowances

	1	2	3	4	5	6
1	Unit	Small-scale maps	Medium-scale maps	Large-scale maps	Road maps	Aeronautical charts ¹
2	Field army HQ.	25	75	50	75	50
3	Corps HQ	15	40	75	50	25
4	Div HQ	5	25	55	50	10
5	Bde HQ	1	7	² 14	15	3
6	Bn HQ	0	3	² 12	5	0
7	Co HQ	0	1	(³)	1	0

¹ Add one per organic aircraft.

² Bde and bn needs for service units are 50 percent of those for combat units.

³ 50 percent of the needs for combat co in (b) above, or one copy per co, whose needs are based on officer strength.

- (2) *Summary of totals.* Numbers given are number of copies of each different sheet for initial issue for average operations and include a small reserve to be held under unit control.

	1	2	3	4	5	6
1	Unit	Small-scale maps ¹	Medium-scale maps ¹	Large-scale maps ¹	Road maps	Aeronautical charts ²
2	Fld army HQ and all fld army nondivisional troops.	50	600	1,500	4,500	200
3	Corps HQ and all corps nondivisional troops.	40	600	1,500	3,000	100
4	Inf div	25	250	1,190	2,750	150
5	Inf div (mech).	8	200	1,650	3,650	150
6	Armd div	8	200	1,650	3,650	150
7	Abn div	8	150	³ 1,000	2,100	140

¹ Number of plastic relief maps not included.

² Production and distribution are Air Force responsibilities. Normally, Air Force distribution to troops is in bulk to CONUS and theater army logistical command map depots; and the engineer makes detailed distribution.

³ Is 1,500 for airborne operations.

c. *Replenishment Requirements.* The following percentages refer to quantities a field army requires under its control (in addition to the initial issue) in field army map depots:

Small scale ---100% of initial requirements

Medium scale ---100% of initial requirements

Large scale --- 50% of initial requirements

d. *Overall Planning Factors.*

Initial issue—

Field army 2,700,000 sheets _135 tons

Corps 420,000 sheets ----- 21 tons

Replenishment—

Field army 180,000

sheets/day -----9 tons/day

e. *Map Coverages.*

Ground Coverage by Scale¹

	1	2	3	4	5
1	Scale	Miles N-S	Miles E-W	Square miles	1 inch = aprx (mi)
2	1:1,000,000	276.0	318.0	88,000	16.0
3	1:250,000	70.0	100.0	7,000	4.0
4	1:100,000	35.0	25.0	875	1.6
5	1:50,000	17.0	14.0	238	0.8
6	1:25,000	8.5	6.5	55	0.4

¹ Average figures are given for approximately 40° north latitude.

f. Typical Planning Procedure. Field army G2 confers with the G3 to determine the types and scales of maps to be used by subordinate units and field army headquarters. An operational map is selected for use by field army and corps headquarters so that all orders, overlays, and references will be based on the same map. The field army engineer attends these staff conferences to advise on the availability of maps in field army and base map depots, capacity of reproduction facilities, and types and scales which can be most readily reproduced. The G3 outlines the area for which map coverage is desired. This area will be well in advance of the present friendly forward dispositions of the field army because of the time required for procurement, production, reproduction, and distribution of maps. In addition, maps of the future area of operations are required early for planning purposes. The G3 also outlines tentative future dispositions, direction of attack, and boundaries of field army and subordinate units. This tentative information will be used by the engineer in determining map requirements for the field army. The procedure is as follows:

- (1) Lay out the projected field army area for which coverage is desired on the pertinent index map.
- (2) In the field army area outlined on the index map, lay out the tentative corps and division boundaries. Project these boundaries to cover the entire area for which map coverage is desired. While these projected boundaries will change during the campaign, divisions and corps of the field army will operate in the area. Therefore, calculations based on one pattern of operations are valid for map procurement purposes.
- (3) List the units requiring each map sheet. Divisions in reserve will require map sheets of the entire front in which they may be employed.
- (4) List the identifying numbers of the map sheets required to cover the area included within the field army bound-

aries, including sheets bordering closely on the boundaries.

- (5) Determine the number of copies of each sheet required at each echelon, using factors presented herein or developed experience factors.
- (6) List the total number of copies of each map sheet required. These are planning figures for *initial issue*. *Replenishment requirements* are determined by multiplying the number of each sheet required for initial issue by the proper percentage factor given in c above. The sum of the initial requirement plus the replenishment requirement for each sheet represents the total number of copies of each sheet that must be procured. These are procured from higher echelon or produced by topographic units within the field army.

3-6. Production of Maps

a. General Production Factors.

- (1) In planning an operation, map requirements are estimated well in advance of the operation. Requirements in excess of the production capability of theater topographic units are requisitioned from CONUS. As a general rule, maps at scales 1:100,000 and larger are reproduced by field army and corps topographic units; maps at scales smaller than 1:100,000 by base topographic battalions assigned to theater army.
- (2) Press size -----22½ x 30 inches
- (3) Impressions per
press-day -----30,000 (bulk work
only)
- (4) Average map
paper consump-
tion per field
army -----5,000 reams/month
167 reams/day
- (5) Maximum map
paper consump-
tion per field
army -----500 reams/day

- (6) Photomap paper consumption per field army -----1,000 reams/month

- (7) Number of colors or press impressions:

Maximum -----8

Standard -----5 (black, brown, blue, green, and red)

Expedient -----1, 2, 3

Two- and three-color maps are far superior in readability to one color and should be adopted when time for standard color reproduction is not available.

b. Production Capacity Required.

- (1) *Field army* — 3,000,000 impressions per month.

- (2) *Theater army*

- (a) Five million impressions per month for each three field armies supported.

- (b) A new mapping capacity of 100 square miles per day.

3-7. Storage of Maps

a. General Planning Factors.

- (1) *Paper.*

	1	2	3
1	Sheet size (in.)	Line map—high wet strength ¹ (lb per 1,000 sheets)	Photomap—coated two sides (lb per 1,000 sheets)
2	22½ x 29 ----	85.7	98.4
3	22 x 29 ----	81.9	94.1
4	24 x 34 ----	104.7	120.4
5	26 x 32 ----	106.8	122.7
6	28 x 50 ----	179.6	206.5
7	35 x 45 ----	201.6	233.1
8	Thickness, 1,000 sheets.	4 in.	3.5 in.

¹ For U. S. hydrographic charts, use twice the weights shown.

(2) Crated or bundled maps.

	1	2	3
1	Item	Avg wt (lb)	Avg cu ft
2	Bundle, 500 map sheets --	60	2
3	Crate, 1,000 map sheets --	150	5

- (3) *Plastic relief maps.* There are many variations in sizes and weights of plastic relief maps. For specific information on storage of this type of map, consult experience factors or the Army Map Service.

b. Floor Space.

- (1) A base map depot for each group of three field armies requires 45,000 square feet, increasing at the rate of 7,500 square feet per month of operations.
- (2) A base map depot for each air force requires 10,000 square feet, increasing at the rate of 2,000 square feet per month of operations.
- (3) An advance map depot serving a field army requires 10,000 square feet.

3-8. Distribution of Maps

a. *General.* Several factors establish maps as a unique supply item which must be handled separately through a system set up exclusively for this purpose. The special factors which place map distribution in a class by itself are as follows:

- (1) *Security.* Bulk production, movement, and issue of maps are accurate indexes of the scope of forthcoming operations.
- (2) *Transitory application.* Changes in culture, as revealed by the constantly expanding sources of information, may quickly render maps obsolete and require several improved editions or issues in the course of a single operation.

- (3) *Relation to the operation.* Unlike other supply items, maps have a direct relation to the exact place in which the operation is to occur.
- (4) *Phasing of supply.* In general, bulk stocks of maps cannot be prepared, and distribution planned, far in advance. However, collection of source material for map production must be constant and worldwide. Production must be phased to insure the application of the last bit of terrain information which can be safely used. Issue can be made only after an exact assignment of missions has been made.

b. Responsibility.

- (1) Map requirements for a command are computed by the engineer under the staff supervision of the G2. Requisitions are prepared and submitted through engineer channels in sufficient time to permit the reproduction and shipment of the maps required.
- (2) Engineers of corps and larger units are charged with the distribution of military maps in the field, except those maps with a security classification which may require special handling. The supply and transportation battalion of the support command is charged with MAP distribution within divisions. Maps not printed within an echelon are obtained from the engineer of the next higher unit.

c. Depots.

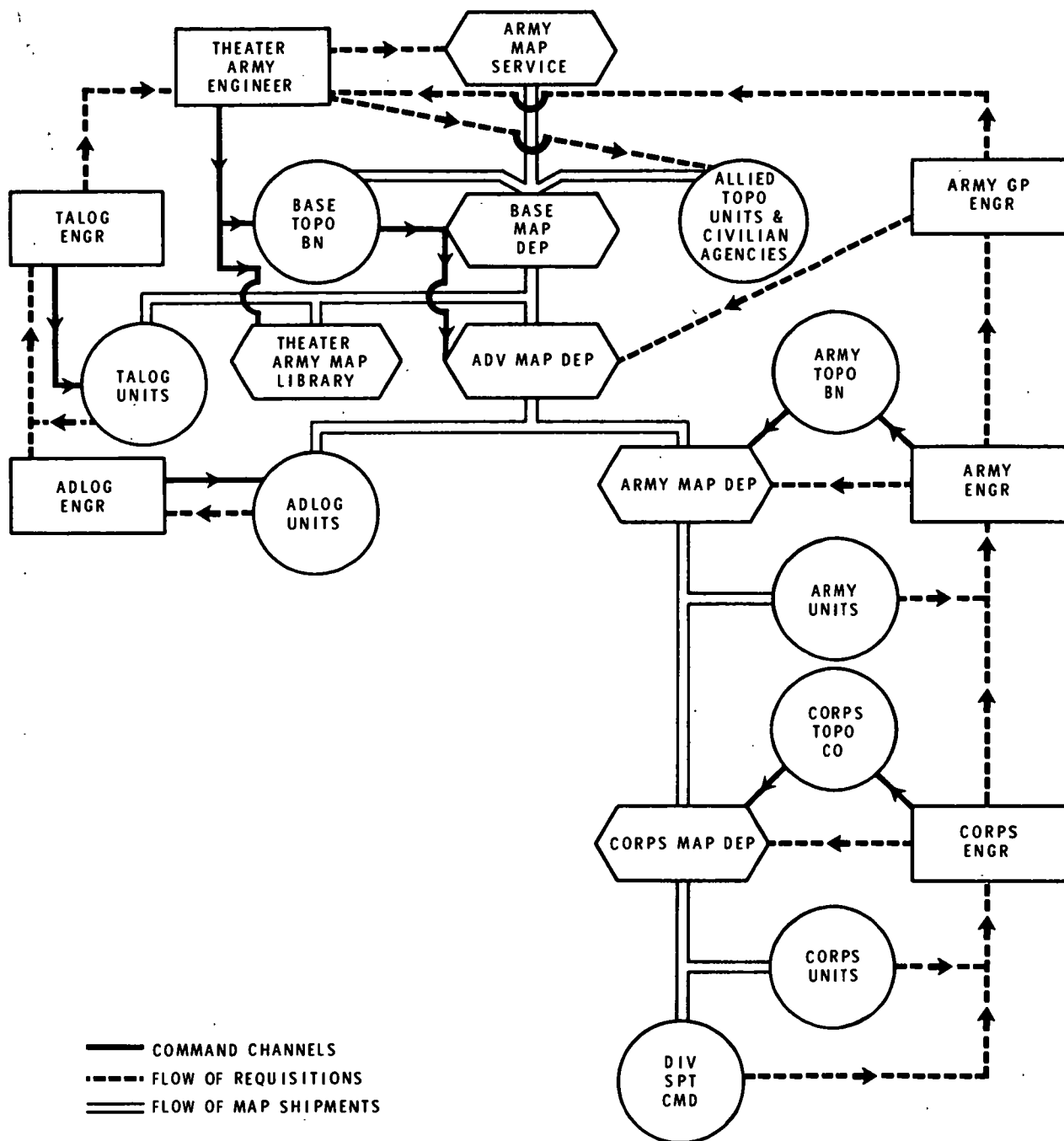
- (1) *Peacetime and CONUS.* Distribution of maps during peacetime and for CONUS is made by requisitions drawn on the theater or the Army Map Service through channels prescribed by the Chief of Engineers.
- (2) *Wartime theater of operations.*
 - (a) BALOG and ADLOG map depots are located in the communications zone, with the ADLOG depot near the forward limit of the communi-

cations zone. BALOG map depots receive and store bulk stocks from the Army Map Service and base reproduction plants; break down and distribute bulk stocks to ADLOG depots; distribute to BALOG depot units; and operate a retail map store for BALOG headquarters. ADLOG map depots receive and store bulk stocks from BALOG map depots; break down and distribute bulk stocks to field army map depots; and operate a retail map store for the headquarters of units located in the advance section.

- (b) The field army map depot is located in the field army service area, usually near field army rear headquarters. In a fast-moving operations, it may be necessary to operate two map depots which leapfrog each other as the field army headquarters move forward. The field army map depot has functions parallel to those of the base map depot. The depot is operated by elements of the field army topographic battalion.
- (c) The corps map depot is located in the corps rear area and has the same functions as the base map depot, but on a smaller scale. It is operated by elements of the corps topographic company.
- (d) Operation of the division map stores is the responsibility of the support command commander. The only functions performed are to receive bulk stocks, distribute maps to divisional and attached units, and store the division reserve map stocks.

d. Labor Estimates. Map depot labor may be estimated at 20 man-hours per 10,000 maps issued, including rolling, coding, packing, and collating unit packages.

e. Normal Map Distribution Flow Chart (fig. 3-1).



NOTE: A LIST OF MAPS AUTHORIZED FOR ISSUE IS NORMALLY PUBLISHED BY CORPS OR ARMY. USING THIS LIST AS AN AUTHORITY, UNITS MAY REQUISITION MAPS DIRECTLY FROM THE DEPOT SERVING THEM. MAPS NOT ON THE LIST MUST BE REQUISITIONED THROUGH THE APPROPRIATE ENGINEER.

Figure 8-1

3-9. Terrain Models and Plastic Relief Maps

The determination of quantity requirements and the issuance of terrain models and plastic relief maps are matters for staff control. Terrain models and plastic relief maps are seldom stocked outside base plants. The Army Map Service is currently the only base plant for terrain models and does stock plastic relief maps at scales of 1:250,000, 1:1,000,000, and certain other miscellaneous scales. These maps can be requisitioned through proper engineer channels. Quantity requirements depend solely on the estimate of the military situation. The necessary provisions to meet these requirements are determined by staff studies of combat needs; the resultant production and supply of models and plastic relief maps are determined by command decision. The commander, having model-making units under his control, directs that a G2 intelligence study and an engineer technical appraisal be performed to determine what models are to be constructed. When assigned model-making capacities are inadequate, the commander submits appropriate requests to higher headquarters. Upon completion of construction, the model is issued immediately and directly to the headquarters or command for which it was produced.

3-10. Gazetteers

a. Gazetteers (place-name indexes) are issued to higher headquarters only. Initial allowances per medium-scale map series are as follows:

Theater headquarters	25
Theater army headquarters	25
Army group headquarters	10
Field army headquarters	5
Corps headquarters	2
Division headquarters	2

b. Production, storage, and distribution of gazetteers are identical with mapping responsibilities (para 3-3); in CONUS, the Corps of Engineers is responsible; in a theater of operations, the theater army engineer.

3-11. Trig Lists

a. *General.* A trig list is an organized grouping of data defining geodetic control positions.

The respective elevations, descriptions, and other pertinent information for these ground control points appear within the limits of a map or maps of a certain series to which they are keyed. The horizontal positions are generally arranged by increasing northings on the map sheet so that the user can locate quickly any point on a given map sheet of a series. The vertical stations (bench marks) along the lines of spirit leveling are usually arranged consecutively along the route of the leveling survey.

b. *Trig Lists Normally Provided in Bulk at Each Echelon.* Trig lists normally are provided in bulk at each of the following echelons:

- (1) Army group headquarters and army group troops.
- (2) Field army headquarters and field army troops.
- (3) Corps headquarters and corps troops.
- (4) Airborne division.
- (5) Armored division.
- (6) Infantry division.
- (7) Infantry division (mechanized).
- (8) U.S. Army missile command.

c. *Number of Trig Lists at Each Map Scale* (i.e., area coverage required at each scale). The scale of the map sheet to which each trig list is keyed and the number of map sheets covered by a particular trig list will vary from country to country because of density and distribution of the geodetic control. Therefore, it will be necessary to determine the number of map sheets covering the specified area and relate this information to the *Trig List Catalog*, from which the scale and number of map sheets covered per trig list can be determined. A trig list key number appears in the *Trig List Catalog* and on the cover of each trig list. For identification and logistical reference, the trig list key number is used.

- (1) *Field army area coverage.* The number of different trig lists required per field army can be determined on the same basis as for maps.
- (2) *Division and smaller unit area coverage.* The number of trig lists required to cover an average area of operations can be determined on the same basis as for maps.

d. Guides for Estimating Quantities of Trig Lists Required for Initial Issue.

- (1) Trig lists should be distributed only to those units having requirement for geodetic data (i.e., staff engineers, engineer topographic units, artillery units, missile units, etc.).
- (2) In addition to the guides stated in (1) above, the following quantities are needed by units indicated.

Note. In most foreign countries, trig lists are classified CONFIDENTIAL.

Unit	Number of trig lists
(a) Army group:	
Army group engineer -----	1
Survey liaison detachment --	1
(b) Field army:	
Field army engineer -----	1
Engineer bn (army) (topo) -	2
(c) Corps:	
Corps engineer -----	1
Engineer co (corps) (topo) -	2
Corps artillery -----	10
Per weapons bn -----	1
(d) Infantry division:	
Division artillery -----	8
HQ and HQ btry -----	(3)
3 FA how bn, 105-mm (towed) (ea 1) -----	(3)
1 FA how bn, 155-mm/ 8 in. (towed) -----	(1)
FA bn HJ (SP) -----	(1)
Division engineer -----	1
(e) Infantry division (mechanized):	
Division artillery -----	13
HQ and HQ btry -----	(3)
3 FA how bn 155-mm (SP) (ea 2) -----	(6)
FA how bn 155-mm/ 8 in. (SP) -----	(2)
FA bn HJ (SP) -----	(2)
Division engineer -----	1

Unit	Number of trig lists
(f) Armored division:	
Division artillery -----	13
HQ and HQ btry -----	(3)
3 FA how bn, 155-mm, SP (ea 2) -----	(6)
FA bn, 155-mm, 8-in. how, (SP) -----	(2)
FA bn bn, HJ (SP) -----	(2)
Division engineer -----	1
(g) Airborne division:	
Division artillery -----	6
HQ and HQ btry -----	(2)
3 FA how bn, 105-mm (ea 1) -----	(3)
FA how/LJ bn, 155- mm (towed) -----	(1)
Division engineer -----	1
(h) U.S. Army missile command. To be determined by the mission.	

e. Production of Trig Lists.

- (1) **Responsibilities.** Compilation and printing of trig lists will normally be accomplished by the Army Map Service (CONUS) and all military topographic units (theater of operations) having the geodetic data and survey results necessary to compile field sketches for each station, to prepare bilingual descriptions, and to compute necessary coordinate systems required for the area. Trig lists produced in CONUS are considered adequate reproduction material and can be reproduced in the theater of operations by military topographic units.
- (2) **Format.** Trig lists are bound publications of 1/4- to 1/2-inch thickness, with a trim size of 9 x 11 inches, and are printed on map stock, high wet-strength paper.

Section III. AERIAL PHOTOGRAPHY

3-12. Types

a. Types of Aerial Photos. An aerial photo is any photograph of a portion of the earth's surface taken from a vehicle in flight. Aerial

photos may be taken with black-and-white, color, infrared, or other film. The following are types of aerial photos:

- (1) **Vertical photo.** An aerial photo taken

with the optical axis of the camera approximately vertical to the earth's surface. The scale of vertical photography is approximately uniform throughout the image.

- (2) *Oblique photo.* An aerial photo taken with the camera axis intentionally directed between the horizontal and vertical. The scale of an oblique photo decreases progressively from foreground to background.
- (3) *Composite.* An aerial photo made by assembling the separate photographs taken by each lens of a multiple-lens camera in a simultaneous exposure.
- (4) *Stereopair.* Two aerial photos with sufficient overlap and consequent duplication of imagery to make possible stereoscopic examination of an object or area common to both.
- (5) *Photomosaic.* An assemblage of overlapping aerial photographs whose edges have been matched to form a continuous photographic representation of a portion of the earth's surface.
- (6) *Continuous strip photo.* An aerial photo of a strip of terrain in which the image remains unbroken throughout the entire length of the film.

b. Types of Aerial Photo Coverage. The term "aerial photo coverage" denotes the ground area represented on aerial photos, photomaps, and photomosaics. Aerial photo coverage falls into two general classes: intelligence cover and mapping cover. Coverage for mapping is related to the type and accuracy of the map to be produced. Planning data for mapping coverage are contained in TM 5-243 and in special publications.

- (1) *Basic cover.* Basic cover is complete photo coverage of a projected area of

operations flown periodically or seasonally to fulfill general operational and intelligence requirements and to provide, with subsequent photography, a basis for comparative photo studies. Basic cover usually extends from friendly forward dispositions to a depth of 100 miles or more, as required, into enemy-held territory. For greatest effectiveness, basic cover should be at a scale of 1:12,500 or larger.

- (2) *Tactical cover.* Tactical cover is current vertical stereoscopic photography across the field army front extending from friendly forward dispositions to a depth determined by operational and intelligence requirements. The depth to which it is flown is usually determined by the maximum range of friendly artillery or by the location of selected objectives during an offensive operation. For maximum effectiveness, it should be at a scale of 1:10,000 or larger. Tactical cover is flown as requested by field army.
- (3) *Special cover.* Special cover is photography specifically requested for special study of selected targets or critical areas to meet immediate information requirements of combat units. The scale and type of photography will vary, depending on the type of target and the information required.

3-13. Requirements for Aerial Photography

a. An initial issue of basic cover is made to field army units according to their requirements. Supplemental issues are made as required during the progress of the campaign. Typical initial issue of basic cover is shown in the following chart:

	1	2	3	4	5	6	7
1	Unit or agency	Number of sets	Depth into enemy territory (km)	Number 9 x 9-in. photos		Total (approx lb)	
				1:25,000	1:10,000	1:25,000	1:10,000
2	Theater army, base topo bn.....	2 sets theater army area.....	480	40,000	248,000	1,332	8,266
3	Fld army G2 (air recon spt bn).....	(Based on 160 km width) 2 sets fld army zone/sector.	480	20,000	124,000	666	4,133
4	Fld army topo bn.....	(Based on 160 km width) 1 set fld army zone/sector.	480	10,000	62,000	333	2,066
5	Fld army G2 (PI sec).....	(Based on 160 km width) 1 set fld army zone/sector.	480	10,000	62,000	333	2,066
6	Corps G2 (PI sec).....	(Based on 55 km width) 1 set corps zone/sector.	160	1,200	7,175	40	240
7	Corps topo co.....	(Based on 55 km width) 1 set corps zone/sector.	160	1,200	7,175	40	240
8	Corps arty (PI sec).....	(Based on 55 km width) 1 set corps zone/sector.	160	1,200	7,175	40	240
9	Div G2 (PI sec).....	(Based on 15 km width) 2 sets division zone/sector.	80	400	2,110	17	140
10	Div arty (PI sec) ¹	(Based on 15 km width) 1 set division zone/sector.	80	200	1,055	7	70
				ea div arty	ea div arty	ea div arty	ea div arty

¹ Attached to division from military intelligence battalion, field army.

b. Detailed planning data for determining the number of aerial photographs required to cover a given area are contained in TM 30-245. For general planning purposes, the minimum number of photographs required for stereoscopic coverage of an area at a desired scale can be determined by dividing the square meters of the area by the net gain per photograph. The minimum number of photographs should be increased by about 20 percent to allow for overedge coverage. The net gain planning factors are as follows:

- (1) For 9 x 18-inch photography:

Net gain =

$1/40 S^2$ (S = denominator of scale of desired photography)

- (2) For 9 x 9-inch photography:

Net gain = $1/80 S^2$

Example:

Given: An area 8,000 meters by 12,000 meters to be photographed at a scale of 1:5,000.

Find: The number of 9 x 18-inch photographs required.

Solution: $\frac{8,000 \times 12,000 \times 40}{5,000^2} = 154$ photographs minimum

154 + 20 percent = 185 total photographs required

c. The following table may be used for initial rough estimates of aerial photo requirements.

Total Photo Requirements for a Field Army

	1	2	3	4	5
1	Area	Cover (scale 1:10,000)			
		Basic ¹		Tactical ² (depth 25 km)	
		Photos	Wt/lb	Photos	Wt/lb
2	Field army zone/sector (based on 160 km width).	Depth 21,600	160 km 728	1,600	96
3	Corps zone/sector (based on 60 km width).	Depth 3,640	80 km 255	480	34
4	Division zone/sector (based on 15 km width).	Depth 1,560	40 km 108	160	11

¹ Based on issue table (a above).

² Per set of photos.

3-14. Aerial Photo Reproduction and Photointerpretation Units

a. *Military Intelligence Battalion Air Reconnaissance Support, Field Army (TOE 30-5D).*

(1) *Military Intelligence Detachment, Air Reconnaissance Support, Field Army (TOE 30-7D). Reproduction section.*

	1	2	3	4
1	Methods of reproduction	Sheet size	Remarks	Capabilities
2	Contact printing aerial photos from negatives.	9- x 9- or 9- x 18-inch prints.	Section reproduces, identifies, and distributes aerial imagery obtained from the tactical air force reconnaissance elements.	Reproduction, identification, packaging, and delivery of up to 4000 9- x 18-inch prints of aerial imagery per operational period of 8 hours.

(2) *Imagery interpretation section (TOE 30-7D).*

	1	2
1	Remarks	Capabilities
2	Performs detailed interpretation of aerial imagery for the field army as required.	Plots and performs immediate interpretation of 950 9- x 18-inch air photographs (or the equivalent) in a 24-hour period, and prepares and disseminates priority interpretation reports on this imagery. Provides liaison with reconnaissance elements of the tactical air force which provide support to the field army, briefs and debriefs air force pilots to secure information obtained from visual sightings.

b. *Air Force Photographic Units.*

	1	2	3
1	Unit	Photographs furnished	Remarks
2	Reconnaissance wing (theater of operations).	Specialized photography needed by topographic units for photogrammetry and photography for strategic purposes beyond the scope of reconnaissance wings of tactical air commands and tactical air forces.	Wing may include mapping and charting squadrons. Mapping photography ordinarily not suitable for intelligence purposes because of small scale and lack of detail. May contain important information, however, and prints should be made available to military intelligence officers for study.
3	Reconnaissance wings of tactical air commands and tactical air forces.	Photographs needed for intelligence or combat purposes (single photographs, vertical and oblique; stereopairs; or night photographs).	Also visual reconnaissance missions are capable of providing limited vertical and oblique photographs. Photographic missions capable of large quantities of high altitude vertical and oblique photographs and, under extremely urgent circumstances, limited and low altitude vertical and oblique photographs.

Section IV. EXPRESSING TIME, DATES, AND NATURAL PHENOMENA

3-15. Time and Dates

a. Time. Time is expressed in a group of four digits, ranging from 0000 to 2400. The first two digits are the hours after midnight, and the remaining two digits indicate the minutes past the hour. When the hour can be expressed by a single digit, it is preceded by zero (0); for example, 0625 for 6:25 a.m. Correct official time is available at the nearest signal center.

b. Dates.

- (1) The day, month, and year are expressed in that order, except when it is necessary to specify a six-digit time group and then the following order is used: the first two digits indicate the day of the month, the next two digits indicate the hour, and the last two digits indicate minutes past the hour.

Example: 070625 Dec 47 (6:25 a.m. 7 Dec 47).

The day is expressed by numerals; the month is either spelled out or abbreviated. Abbreviations, if used, consist of the first three letters of the word. The year is expressed by four digits or by the last two digits.

Example: 14 January 1946; 14 Jan 1946; 14 Jan 46.

- (2) When it is desired to keep the date secret, dates may be expressed by a letter such as D plus or minus a numeral.

c. Greenwich Civil Time. Communications between headquarters in different time zones are usually dated, and references to dates and times are usually made in Greenwich civil time. The standard time at Greenwich, England, is accepted as the basis for measuring time throughout the world. Local civil time can be changed to Greenwich civil time by adding or

subtracting the appropriate number of hours as indicated in the time zone chart in *e* below. Greenwich civil time can be changed to local civil time by reversing the signs of the time zone chart. Appropriate adjustments must be made for daylight saving time and war time.

d. Time Suffixes. Time groups expressing Greenwich civil time are designated by the letter suffix Z immediately following the last digit of the group. For example, 190225Z indicates 2:25 a.m. on the 19th of the current month, Greenwich civil time. Any other suffix used after a four-digit time group (corresponding to the Z of Greenwich civil time) indicates the zone in which the local civil time is expressed. It does not designate location on the earth's surface. The proper suffix can be determined from the time zone chart and the time conversion table in *e* and *f* below. For example, Kansas City is located in the sixth time zone west of Greenwich. If that city keeps local civil time, the time group suffix will be S.

e. Time Zone Chart (fig. 3-2).

f. Time Zone Conversion Table (fig. 3-3).

3-16. Natural Phenomena

a. General. Staff officers avoid the use of such indefinite terms as *first light*, *last light*, *day-break*, *daylight*, *dusk*, and *dawn*. Terms of a definite nature, such as *beginning* or *ending of evening* or *morning nautical* or *civil twilight*, are permissible. However, expressions of these times to lower units must be in clock time.

b. Published Data. For purposes of military planning and to facilitate staff work in expressing natural phenomena in time, theater commanders prepare and publish for the theater as a whole or for major geographic portions thereof daily time, sunrise, sunset, twilight, moon, and tide tables and specify the number of hours the local time differs from Greenwich civil time. A sample of the type of chart which should be prepared and issued for each major operation or operational area is shown in *e* below. They are available through

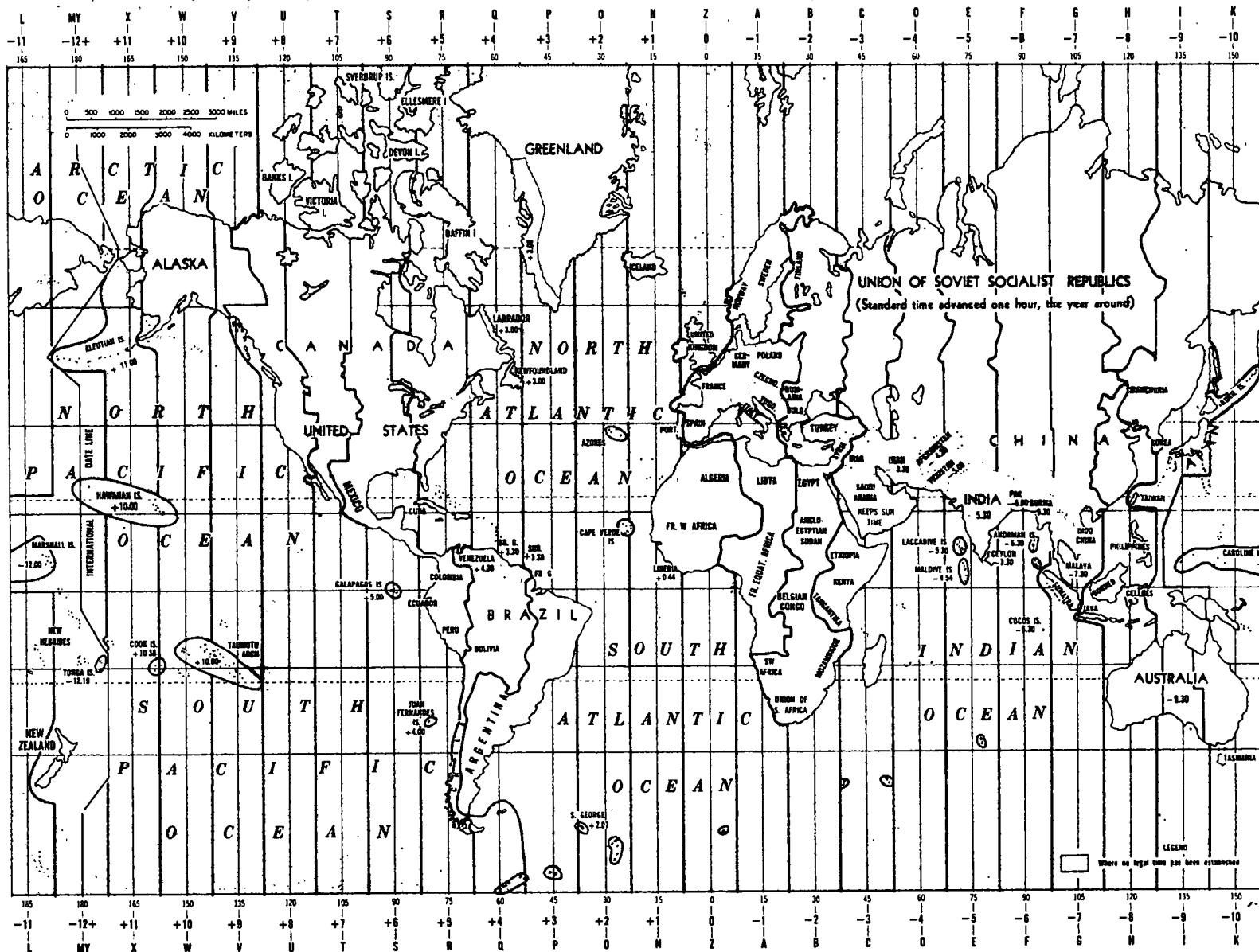


Figure 3-2

TIME ZONE	HOURS OF DAY IN LOCAL TIME																																																							
	PREVIOUS DAY												SAME DAY																								NEXT DAY																			
0 (Z)	12	13	14	16	18	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11								
-1 (A)	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12								
-2 (B)	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13								
-3 (C)	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14								
-4 (D)	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15								
-5 (E)	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16								
-6 (F)	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17								
-7 (G)	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18								
-8 (H)	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19								
-9 (I)	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21							
-10 (K)	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	16	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21								
-11 (L)	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	16	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	16	19	20	21	22								
-12 (M)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23								
+1 (N)	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	16	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10								
+2 (O)	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	16	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09								
+3 (P)	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08								
+4 (Q)	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07								
+5 (R)	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06								
+6 (S)	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05								
+7 (T)	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04								
+8 (U)	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03								
+9 (V)	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02								
+10 (W)	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	16	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01								
+11 (X)	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00								
+12 (Y)	00	01	02	03	04	06	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23								
	PREVIOUS DAY																							SAME DAY																																

Figure 3-3

Army channels. Data on time of sunrise, sunset, morning and evening twilight, and moon phases can also be found in TM 5-236-series (current year).

- (1) *Datum.* The astronomical data are for sea level and will not vary more than 5 minutes for each degree of the difference in longitude from the standard meridian.
- (2) *Time used.* The times on the diagram are for the time meridian indicated in the heading. When another time meridian is to be used in the field, it will be found convenient to change the figures representing hours on the left of the large diagram to conform to the new time. If the time meridian to be used is east of the one shown on the diagram, increase the figure by 1 hour for each 15°; if west, decrease the figures.
- (3) *Dates.* In the upper diagram, each day from midnight is represented by a space between two lines. In the lower diagram, the days are represented by

vertical lines covering the period from noon of one day to noon of the next. The dates at the bottom of the diagram differ from those at the top because the date changes in passing through midnight.

- (4) *Tides.* The times of the high and low tides are shown by curves in the lower graph of the diagram in *e* below. By noting the sequence of the tides during a day, the height of any particular tide can be found from the upper graph of the diagram in *e* below.
- (5) *Moonlight.* For astronomical twilight and solar darkness, periods of moonlight and dim moonlight are shown on the lower diagram. During the period of *moonlight*, the intensity of light will vary between the brightness of the full moon at zenith and about one-third of this value. During the period of *dim moonlight*, the intensity varies from about one-third to one-tenth of the brightness of full moon at zenith.

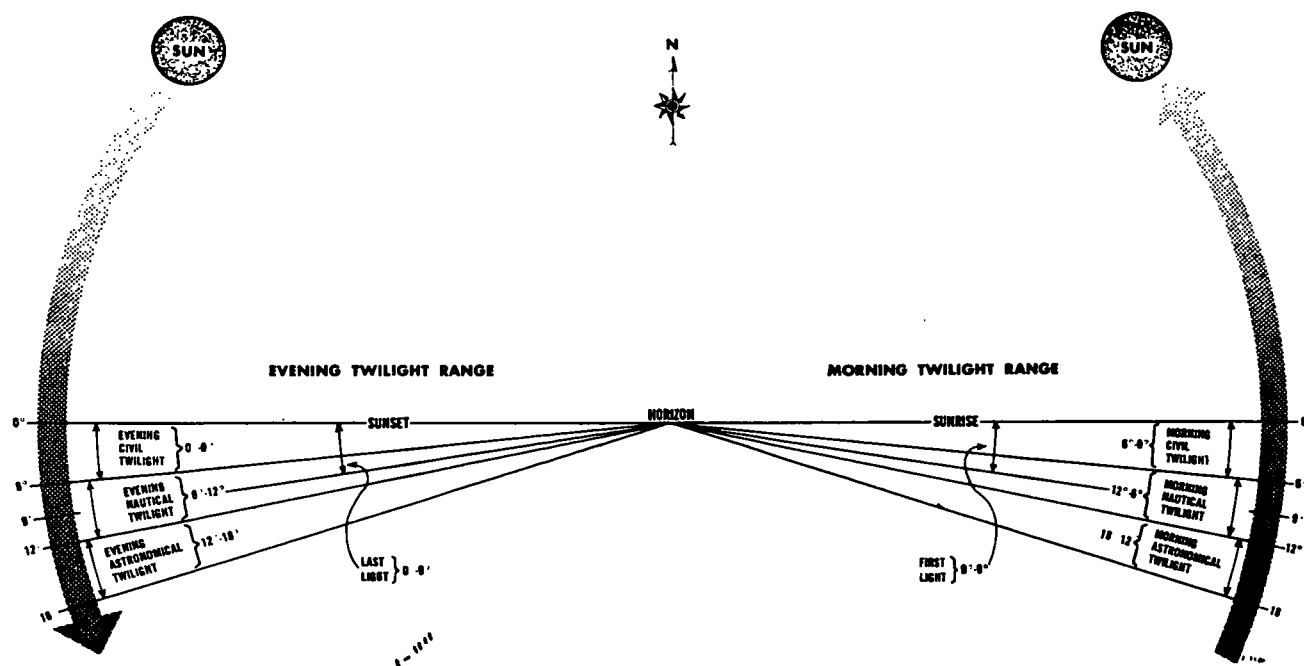
- (6) *Moon's phases.* The phases of the moon are shown below the day on which they occur.

c. *Twilights* (fig. 3-4).

- (1) Twilights are the periods of solar illumination prior to sunrise and after sunset. Both morning and evening twilights are divided into three periods: astronomical, nautical, and civil. The interval of time between the instant the upper edge of the sun's disk appears on the horizon and the instant the center of the sun is 6° below the horizon is civil twilight, 6° – 12° nautical twilight, and 12° – 18° astronomical twilight.
- (2) Astronomical twilight affords such meager light, if any, that for military purposes it may be considered as a period of darkness.
- (3) Nautical twilight provides enough illumination to carry on most types of ground movement without difficulty and approaches conditions expected under full light of day. Vision

is limited to 365 meters or less. For military purposes, during the nautical twilight periods weapons can be employed within the range of vision stated and daylight calculations relative to movement will apply, including restrictions on such movement. Bomb loading and repair work cannot be carried on without the use of artificial light.

- (4) Civil twilight affords sufficient light to carry on normal day activities. This period is the earliest or latest that provides sufficient natural illumination of targets to allow efficient observed artillery fire or day bombing.
- (5) Except for high latitudes, values for the approximate durations of astronomical, nautical, and civil twilights may be considered equal.
- (6) *First light* and *last light*, terms used by the armed forces of the United Kingdom, include a slightly greater period of twilight than defined by civil twilight.



NOTE: Degrees refer to center of sun below horizon.

Figure 3-4

d. Effect of Weather on Light. Weather has been disregarded in the above considerations. Smudge, fog, clouds, refraction, reflection, and precipitation affect the degree of illumination.

These factors can be included in the calculations by means of experience tables compiled in the area over a period of time and from meteorological forecasts for the area only.

e. Diagram of Tides, Sunlight, and Moonlight (fig. 3-5).

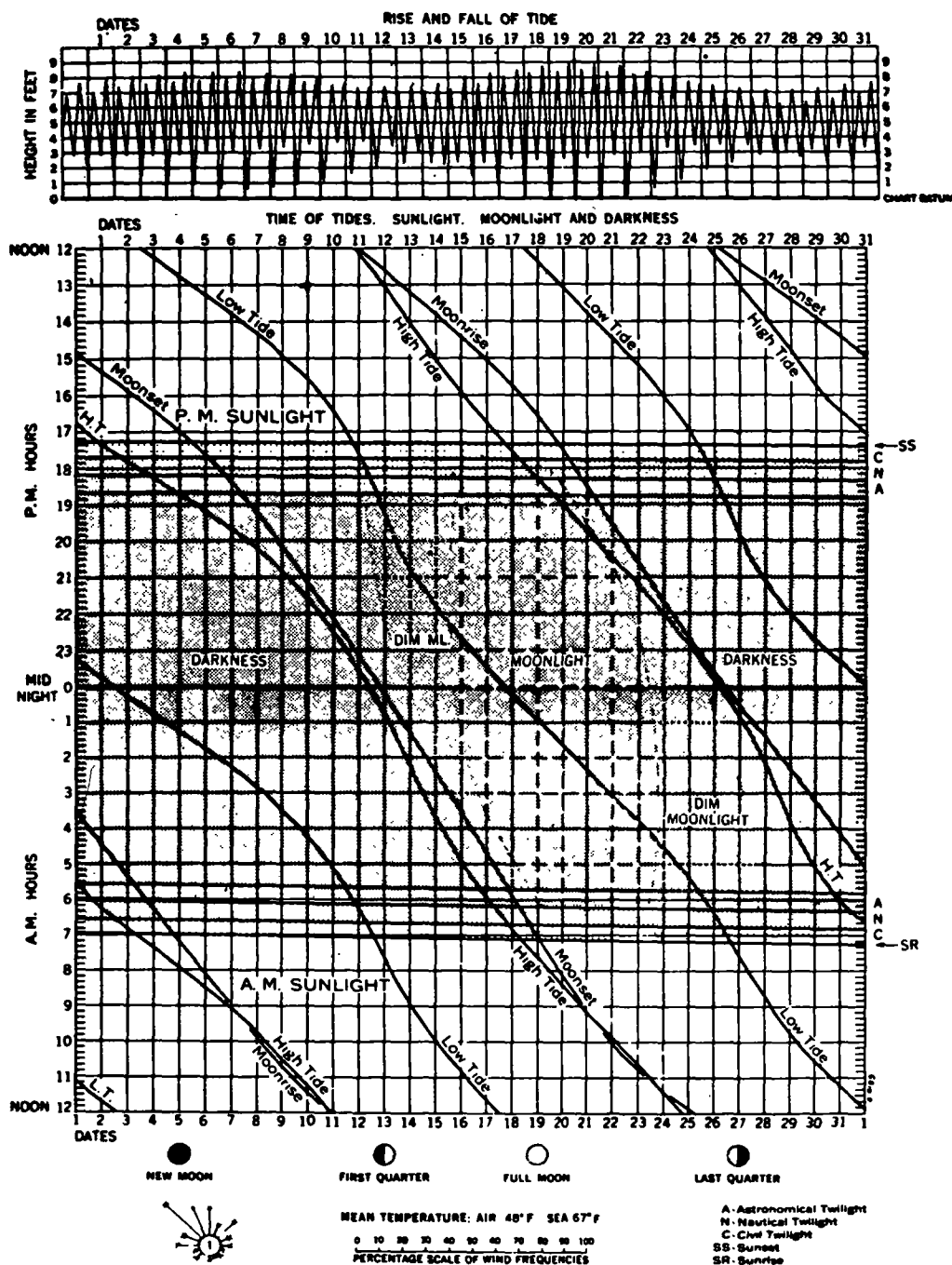
KAGOSHIMA—WAN, KYUSHU *

DECEMBER 1945

Lat 31° 30' N., Long 130° 40' E.

Time Meridian: 135° E.

Sunlight and Moonlight Data Computed for Lat 31° 30' N., Long 130° 40' E.



*This diagram, with the changes indicated, is also applicable to the following places:
TOMARI URA.—Add 10 minutes to times of high and low tides, subtract ½ foot from heights of high tides.
ODOMARI WAN.—Subtract 25 minutes from times of high and low tides, subtract 1 foot from heights of high tides.

Figure 3-5

Section V. THE WORLD GEOGRAPHIC REFERENCE SYSTEM**3-17. General**

a. The World Geographic Reference System (GEOREF) is used in all joint air defense operations. Army air defense uses GEOREF on early warning plotting boards, on plan position indicator (PPI) screens, for reporting, for installation locations, and for target positions.

b. GEOREF is a worldwide position reference system that may be applied to maps or charts graduated in latitude and longitude, regardless of projection. It is a method of expressing latitude and longitude in a form suitable for rapid reporting and plotting.

c. Mobile air defense units are required to

report to higher headquarters any new position occupied in GEOREF coordinates.

3-18. The GEOREF Identification Code

The GEOREF system uses an identification code that is divided into three main divisions. The GEOREF designations are read by the same rule as military coordinates: READ RIGHT-UP. The complete GEOREF coordinate is expressed by combining the identification letters for the first and second divisions with the numbers identifying the third division. For a detailed explanation of this system, see FM 44-8.



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4



CHAPTER 4 OPERATIONS

Section I. TROOP PLANNING

4-1. Introduction

a. General. The number and type of units to be employed in a given operation are determined by the mission; the character, disposition, and capabilities of the enemy; the terrain and climate; the availability of troops and/or units; the availability of transportation; and the availability of supplies and equipment.

b. Basic Steps in Troop Requirements Planning.

- (1) The following general steps are essential to the accomplishment of sound troop requirements planning:
 - (a) Determination of the functions or tasks to be performed.
 - (b) Determination of quantitative workload.
 - (c) Selection of type of operating unit, with capability required.
 - (d) Calculation of number of operating units required.
 - (e) Provision for command and control.
- (2) The accomplishment of the steps listed in (1) above requires a detailed study of the overall mission by each member of the staff in light of his responsibilities and the factors which affect the accomplishment of the mission.

c. Planning Procedures. Troop requirements planning passes through three phases—*estimation*, *calculation*, and *modification*. The first phase, particularly in the case of the establishment of a new theater, must be accomplished with few, if any, tangible figures. Each successive phase is developed with more concrete and accurate data than the preceding one, until a balanced, sound troop list is evolved.

(1) *Phase I planning—estimation.* The initial step in the development of troop requirements must be accomplished with little specific data—often no more than a brief statement of the overall strength of the force to be employed or the number of divisions around which it is to be built. Each planner must employ broad experience factors, such as division and wing slice, troop density, equipment density, replacement and consumption factors, and similar information. *For example*, when the total troop strength is unknown, it can be estimated by using appropriate division and wing slices. From this figure, and from basic vehicle density factors, the number of vehicles in the force can be estimated. Other data are derived in a similar fashion. The margin of error will depend to a great degree on the accuracy of factors employed. Factors representing best available experience should be used, and the planner is cautioned against changing factor values unless he has the experience and background to make such changes valid.

(2) *Phase II planning—calculation.*

- (a) Phase II planning begins when phase I estimates are received from all arms and services in the form of initial tentative troop lists. Troop strengths and equipment lists for the force can be derived from these initial lists, which should be more accurate than the estimates used to initiate planning in phase I. The margin of error between the initial tentative lists and those finally ac-

cepted will depend not only on the adequacy of the planning factors and guidance available to the troop requirement planners, but also on the experience, aptitude, and judgment of the individual planner. General Staff troop planning officers should carefully scrutinize the lists of the arms and services to determine whether they contain errors. Branch strengths in relation to the total force strength should be compared with currently accepted percentages and should be challenged if they deviate significantly.

- (b) When the consolidated initial troop list is available, each planner should review the list and decide, based on the new information from the consolidated list, whether his next revision will increase or decrease and to what extent. The predictions of each planner should be appraised for accuracy, and a recalculation of the first revised troop list should be made as a result of these predictions. This information should then be furnished all planners so that each will be aware of direction and limits of changes which are to be applied.
- (c) When this information is available, phase II planning continues with the preparation of revised estimates by each branch representative. The division slice and other factors suitable only for initial estimation are discarded in favor of actual (or adjusted) figures extracted from the initial lists. Several revisions may be necessary before all arms and services lists are brought into balance with each other. Intelligent adjustment and careful prediction at each successive planning stage will reduce the number of revisions necessary to arrive at a calculated balanced troop list to complete phase II.

(3) *Phase III planning—modification.*

- (a) The consolidated troop list produced in phase II will provide a balanced force, each element of which is capable of performing its mission without augmentation. Modifications, adaptations, or alterations dictated by policy, by command direction, or by conditions peculiar to the theater under consideration are applied in phase III, if not already taken into consideration in phase I or phase II.
- (b) Substitution of indigenous labor for military personnel should be made at this stage. At the same time, lists of class IV equipment to be issued for the use of the indigenous labor forces should be prepared.
- (c) The substitution of indigenous labor for military personnel will immediately throw the troop list out of balance, and it may require several successive revisions such as those made in phase II to restore it to balance. Various services will be affected differently. *For example*, the impact on maintenance units will be relatively minor since the equipment density will not change significantly; but the impact on the medical troop list is great since medical service is provided primarily on the basis of military strength. Other services will be affected to greater or lesser extent depending on the change in military strength and equipment required.
- (d) Since substitution of indigenous labor in phase III will cause an imbalance and make additional revisions necessary, consideration should be given to effecting the substitution earlier in the planning. This would simplify matters for services, such as medical, interested primarily in military strengths; but it will complicate matters for those services which must prepare lists of

class IV equipment for the labor force. If the labor force is planned concurrently with the military forces, the class IV equipment lists must be included in each step and revised accordingly. This will complicate and delay the steps in planning for all services and may introduce greater degrees of error in each step. The decision as to which procedures to follow will be made by the chief of the planning group, but the various supply service representatives should present the advantages and disadvantages of each method and make an appropriate recommendation in each case. It is desirable to establish 100-percent military troop lists against which augmentations and comparisons may be made.

- (e) Arbitrary personnel ceilings are frequently imposed on the supply and administrative services. These should not be applied until phase III since the reduction in strength may not be proportional for all services or for all units within a service. If the full military strength required to accomplish a mission is known, the effects of a reduced strength can be adequately appraised and reported to the head of the planning staff and force commander.
- (f) Final distribution of troops by zone or area and determination and location of depots and other major installations are accomplished in phase III. If these are done tentatively for each troop list prepared in phases I and II, the final determination is simplified, since each planner becomes increasingly aware of the deployment of the troops of other arms and services throughout the theater and progressively

adjusts his own distribution to meet the probable load.

4-2. Troop Requirements, Type Field Army

a. The tables shown in this paragraph indicate the numbers and types of units that might be found in a dual-capable type field army under conditions of general war in a nonnuclear environment. Such a field army is presumed to have three corps of one infantry division, one armored division, and two infantry (mechanized) divisions each. TOE designations shown are current approved types or have been officially designated by the Department of the Army as proposed or tentative types. It is emphasized that the tables in *e* below purport only to illustrate the many and various types of nondivisional units which may be employed in the field and the principles of organization of these units. The tables do *not* attempt to depict an organization for the conduct of operations in a specific situation or to connote in any way that they compose a type force in the field. They have been designed to illustrate the types of units that *may* be found in a field army. Actually, forces within the field army will be tailored in composition or size to perform assigned missions and to meet the requirements of locale and forms of conflict. *For example*, in small theaters of operations where austere lines of communications must be established hastily, many of the units shown in these tables will be deleted. Other organizations, not now listed, may be added, depending on the missions and the environment.

b. The diagrams show the schematic layout of the units and the general areas of their operation. They are not intended to show the attachment or assignment of units to corps and divisions except in a very general way, and they are not intended to show the exact location of units.

c. For troop requirement planning factors for a large theater of operations, see FM 101-10-3, chapter 4.

d. Divisions.

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	Armd div -----	17E	16,350	1	-----	3
3	Inf div -----	7E	15,606	1	-----	3
4	Mech div -----	37E	16,360	2	-----	6

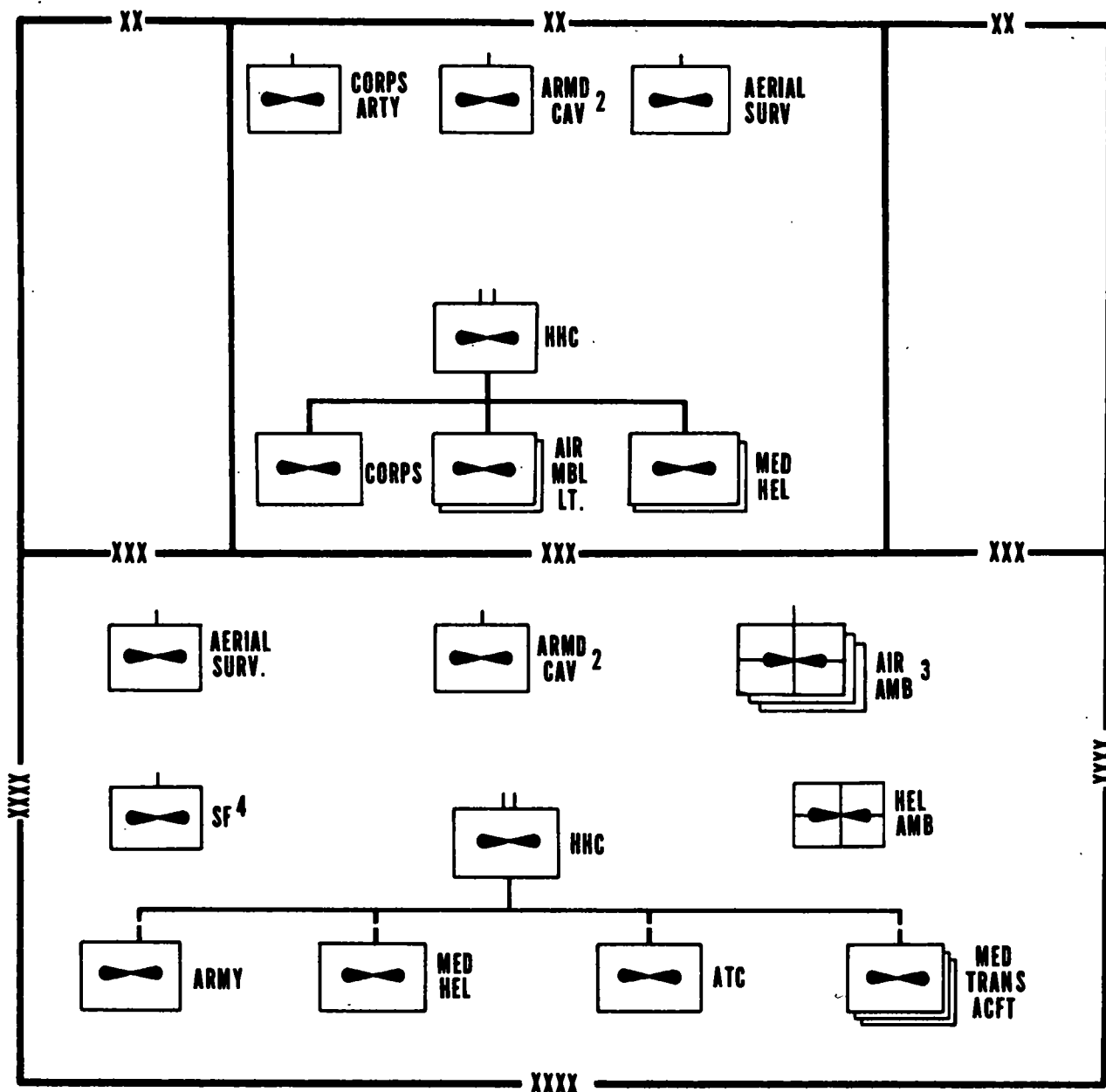
*e. Nondivisional Units.**(1) Armored units—numbers and types.*

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	Armd cav regt -----	17-51D	2,799	1	1	4
3	Separate armored Brigade -----	100E	4,652	-----	1	1

*(2) Army aviation units.**(a) Numbers and types—Army aviation units.¹*

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HHC Trans Acft Bn -----	*1-256E	83	1	1	4
3	Army Avn Co -----	1-137D	158	-----	1	1
4	Corps Avn Co -----	1-127D	181	1	-----	3
5	Armored Cav Rgt Avn Co ² -----	1-67D	168	1	1	4
6	Airmobile Co Lt -----	1-77E	145	2	-----	6
7	Trans Medium Hel Co -----	*1-258E	187	2	1	7
8	Avn Co (Airmobile F/W) -----	1-59D	158	-----	3	3
9	Air Traffic Control Co -----	1-207E	222	-----	1	1
10	Aerial Surveillance Co -----	1-128E	197	1	-----	3
11	Avn Co SF Gp ³ -----	1-307E	195	-----	1	1

¹ See (13) below for Transportation Units performing support missions for Aviation.² Organic to Armored Cavalry Regt TOE 17-61D.³ Organic to SF group.⁴ Draft TOE.

(b) Schematic diagram—Army aviation units¹ (fig. 4-1).

¹ See par (13) below for TC Aircraft Maint and Supply Units.

² Organic to Armored Cavalry Regt.

³ B-Series TOE.

⁴ Organic to Special Forces Group.

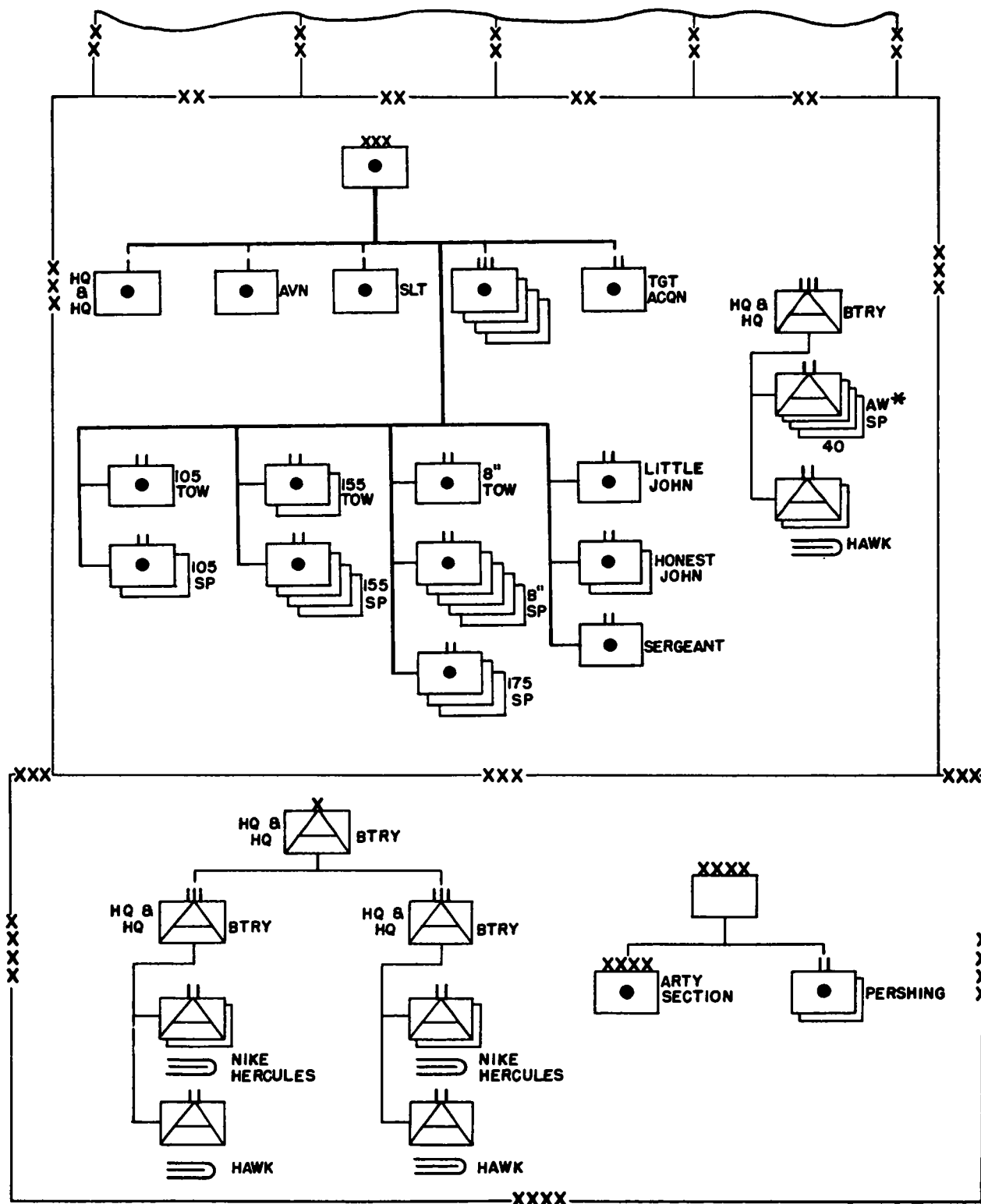
Figure 4-1

(3) *Artillery units.*(a) *Air defense artillery units—numbers and type.*

	1	2	3	4	5	6	7
1	Unit	TOE	TOE strength	TOE strength W/Aug	Corps	Field army	Total field army
2	Hq & Hq Btry, ADA Bde -----	44-2E	107	250	-----	1	1
3	Hq & Hq Btry, ADA Gp -----	44-12E	76	242	1	2	5
4	ADA Msl Bn, Nike Hercules -----	44-535D	781	866	-----	3	6
5	ADA Msl Bn, Hawk (Mbl) -----	44-235D	669	776	2	1	8
6	ADA AW Bn, SP -----	44-85F	672	-----	3	-----	9

(b) *Field artillery units—numbers and types (fig. 4-2).*

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	Hq & Hq Btry Corps Arty -----	6-501E	198	1	-----	3
3	Hq & Hq Btry, FA Grp -----	6-401E	118	4	-----	12
4	FA Bn, 105-mm, Towed -----	6-405E	466	1	-----	3
5	FA Bn, 105-mm, SP -----	6-465E	446	2	-----	6
6	FA Bn, 155-mm, Towed -----	6-425E	525	2	-----	6
7	FA Bn, 155-mm, SP -----	6-455E	530	4	-----	12
8	FA Bn, 8-inch, Towed -----	6-415E	551	3	-----	9
9	FA Bn, 8-inch, SP -----	6-445E	539	4	-----	12
10	FA Bn, 175-mm, Gun -----	6-435D	540	4	-----	12
11	FA Bn, 280-mm, Gun -----	6-535D	459	1	-----	3
12	FA Bn, Little John -----	6-565D	351	1	-----	3
13	FA Bn, Honest John -----	6-525E	356	3	-----	9
14	FA Bn, Corporal -----	6-545E	261	1	-----	3
15	FA Bn, Redstone -----	6-635E	631	-----	2	2
16	FA Bn, Sergeant -----	6-555T	331	1	-----	3
17	FA Bn, Pershing -----	6-615T	615	-----	1	1
18	FA Target Acquisition Bn -----	6-575E	804	1	-----	3
19	FA Searchlight Btry -----	6-558E	151	1	-----	3
20	FA Aviation Btry -----	6-417T	161	1	-----	3



*Normally further attached, 1 Bn/Div

Figure 4-2

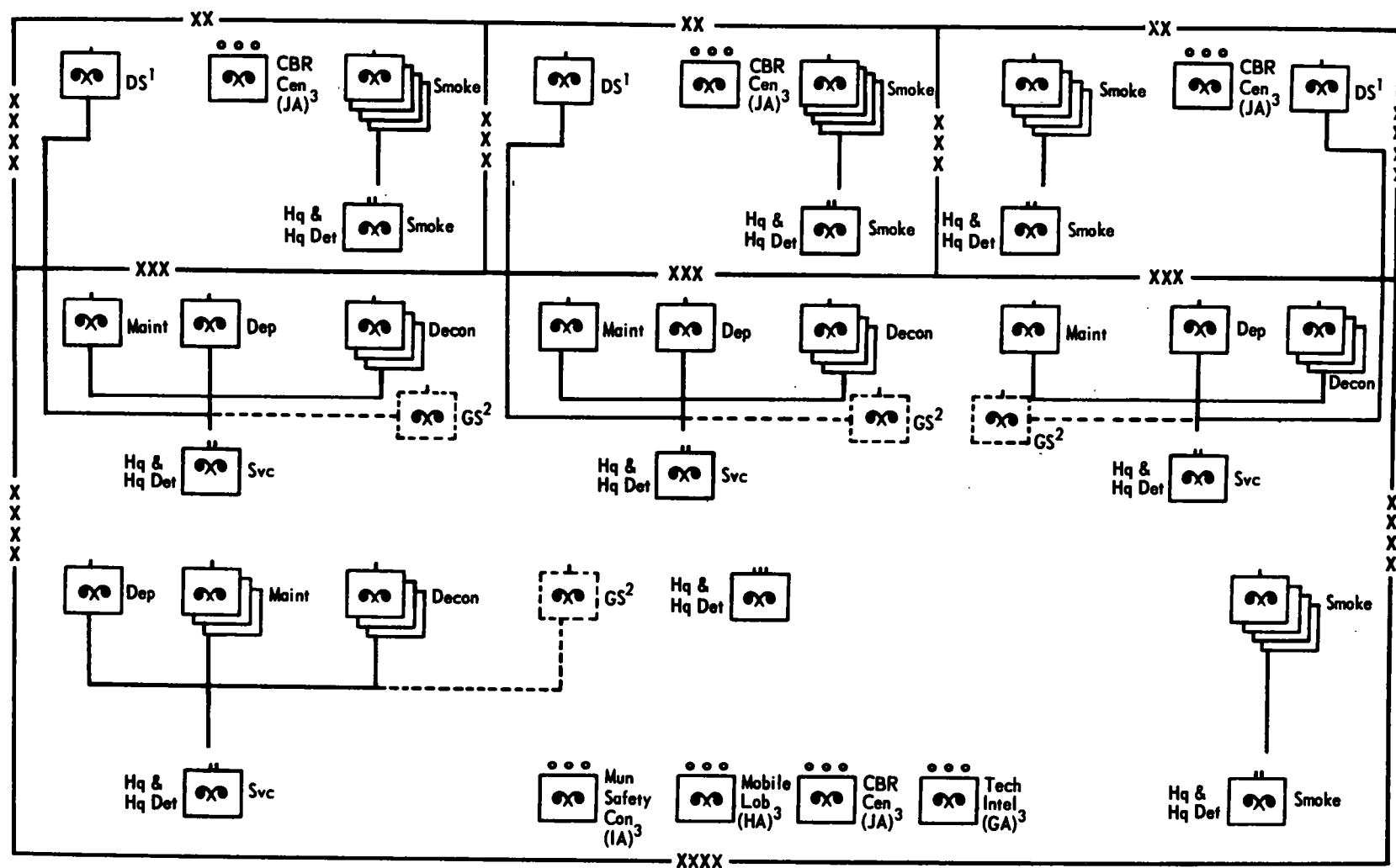
(4) Chemical units.

(a) Numbers and types—Chemical units.

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	Hq & Hq det, cml gp -----	3-32E	50	-----	1	1
3	Hq & Hq det, cml cmoke genr bn -----	3-266E	22	1	1	4
4	Cml smoke genr co -----	3-267E	142	4	4	16
5	Hq & Hq det, cml svc bn -----	3-36E	31	1	1	4
6	Cml direct spt co -----	3-7E	233	1	-----	3
7	Cml general spt co -----	3-147E	131	1	1	4
8	Cml dep co -----	3-67D	144	1	1	4
9	Cml maint co -----	3-47E	99	1	3	6
10	Cml decon co -----	3-217E	115	3	3	12
11	Cml tech intel det (GA) -----	3-500E	10	(¹)	(¹)	(¹)
12	Cml mobile lab det (HA) -----	3-500E	20	(¹)	(¹)	(¹)
13	Cml CBR Center det (JA) -----	3-500E	5	(¹)	(¹)	(¹)
14	Cml mun safety con det (IA) -----	3-500E	8	(¹)	(¹)	(¹)

¹ As required.

(b) Schematic diagram—Chemical units (fig. 4-3).



¹Platoons of chemical direct support company are attached to divisions.

²Chemical general support company can be used to replace or to augment chemical depot, maintenance, and decontamination companies.

³The number of detachments varies according to the requirement.

Figure 4-3

(5) *Engineer units.*(a) *Numbers and types.*

	1	2	3	4	5	6	7
1	Unit	TOE	TOE strength	Corps	FASCOM	Field army	Total field army
2	Hq & Hq Co, Engr Bde (Cbt) (Army) -----	5-101E	133	-----	-----	1	1
3	Hq & Hq Co, Engr Bde (Cbt) (Corps) -----	5-101E	99	1	-----	-----	3
4	Hq & Hq Co, Engr Gp (Cbt) -----	5-52D	116	2	-----	3	9
5	Engr Bn (Cbt) (Army) -----	5-35E	811	8	-----	12	36
6	Engr Bn (Topo) (Army) -----	5-305E	385	-----	-----	1	1
7	Engr Co (Topo) (Corps) -----	5-327E	130	1	-----	-----	3
8	Engr Co (LE) ¹ -----	5-54D	186	2	-----	3	9
9	Engr Co (Dp Trk) -----	5-124E	112	2	-----	3	9
10	Engr Co (Cam) -----	5-97E	69	-----	-----	3	3
11	Engr Co (Pnl Brg) -----	5-77E	127	3	-----	3	12
12	Engr Co (Flt Brg) -----	5-78E	225	3	-----	3	12
13	Engr Fire Ftg Team (FA) ² -----	5-500C	4	-----	6	-----	6
14	Engr Fire Trk Team (FB) ² -----	5-500C	6	-----	6	-----	6
15	Engr Water Tk Team (FD) ² -----	5-500C	6	-----	6	-----	6
16	Engr Brush Fire Trk Team (FE) ² -----	5-500C	2	-----	18	-----	18
17	Engr ADM Plt Hq Team (MA) -----	5-500C	5	2	-----	1	7
18	Engr ADM Liaison Team (MB) -----	5-500C	1	2	-----	1	7
19	Engr ADM Squad Team (MC) -----	5-500C	5	8	-----	4	28
20	Engr Gas Genr Team (GI) ² -----	5-500C	26	-----	1	-----	1
21	Engr CO, Genr Team (GJ) ² -----	5-500C	13	-----	1	-----	1
22	Engr Welding Team (HC) ² -----	5-500C	4	-----	-----	3	3
23	Engr Utilities Team (HG) ² -----	5-500C	83	-----	1	-----	1
24	Engr Map Depot Plat Team (IE) ² -----	5-500C	40	1	-----	-----	3
25	Engr Terrain Team (IK) -----	5-500C	11	-----	-----	1	1

¹ May be organized as an engineer light equipment company, airborne, with an aggregate strength of 177.² Capability may be incorporated into some CO-STAR TOE.

(b) Schematic diagram—Engineer units (fig. 4-4).

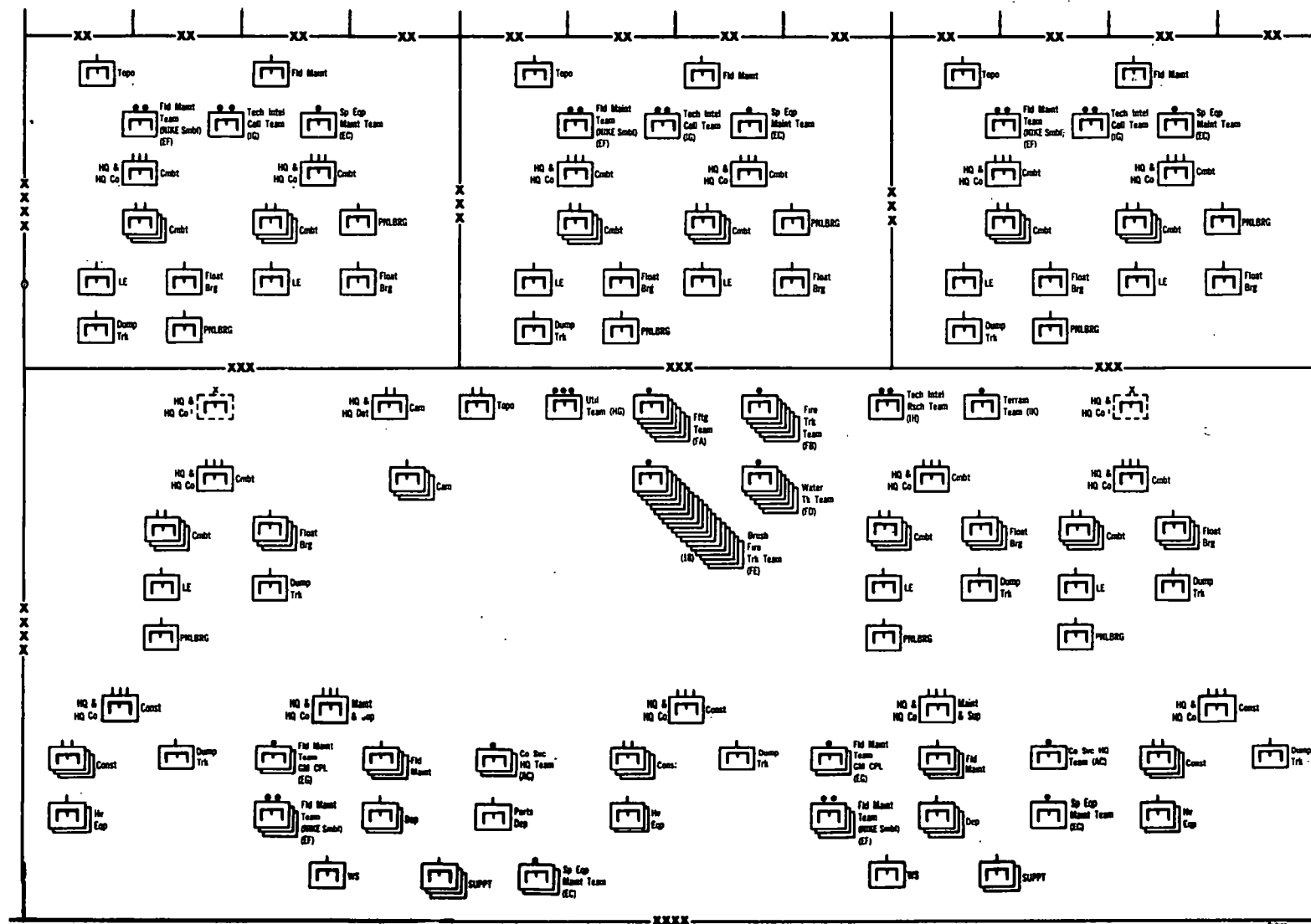


Figure 4-4

(6) *Infantry units—numbers and types.*

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	Separate infantry bde (mech) -----	37-100E	1907	-----	1	1
3	Infantry bn (mech) 3 ea -----	37-45E	901	-----	3	3

(7) *Medical units.*(a) *Numbers and types—Medical units.*

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	H&H Med Bde -----	8-112E	78	-----	1	1
3	H&H Med Gp -----	8-122F	38	1	1	4
4	H&H Med Bn -----	8-126E	34	2	2	8
5	Med Amb Co -----	8-127E	97	4	3	15
6	Med Clr Co -----	8-128E	99	4	3	15
7	Med Coll Co -----	8-129E	190	1	-----	3
8	Med Air Amb Co -----	8-137E	159	-----	3	3
9	PM Unit -----	8-204E	114	-----	1	1
10	Mbl Army Surg Hosp -----	8-571E	91	4	-----	12
11	Evac Hosp (Smb) -----	8-581E	309	6	6	24
12	Conv Cen (Army) -----	8-590E	225	-----	1	1
13	Med Lab -----	8-650E	111	-----	1	1
14	Med Depot -----	8-667E	198	-----	1	1
15	HQ Prof Svc Det (AG) -----	8-500D	15	-----	4	4
16	HQ Vet Svc Det (AF) -----	8-500D	4	-----	1	1
17	HQ Den Prof Svc Det (AI) -----	8-500D	4	-----	4	4
18	Med Det (Equip Maint) (GC) -----	8-500D	5	-----	3	3
19	Med Det (Vet Food Insp) (Small) (JA) -----	8-500D	6	-----	3	3
20	Med Det (Vet Food Insp Svc) (JB) -----	8-500D	54	-----	1	1
21	Med Det (Surgical) (KA) -----	8-500D	7	-----	6	6
22	Med Det (Ortho) (KB) -----	8-500D	7	-----	6	6
23	Med Det (Shock) (KC) -----	8-500D	4	-----	3	3
24	Med Det (Maxillo-Facial) (KD) -----	8-500D	7	-----	3	3
25	Med Det (Neurosurgical) (KE) -----	8-500D	7	-----	6	6
26	Med Det (Thoracic) (KF) -----	8-500D	7	-----	3	3
27	Med Trmt Det (Cml Agts) (KG) -----	8-500D	14	-----	3	3
28	Med Det (Det Svc) (KJ) -----	8-500D	36	-----	30	30
29	Med Det (X-Ray) (KH) -----	8-500D	3	-----	1	1
30	Med Det (Den Prosthetic) (KK) -----	8-500D	4	-----	15	15
31	Med Det (Psychiatric) (KO) -----	8-500D	19	-----	3	3
32	Med Det (Blood Distribution) (NC) -----	8-500D	8	-----	1	1
33	Med Det (OA) -----	8-500D	9	-----	30	30
34	Med Det (Intelligence) (QA) -----	8-500D	12	-----	3	3
35	Med Det (Hel Amb) (RA) -----	8-500D	36	-----	12	12

(b) Schematic diagram—Medical units (fig. 4-5).

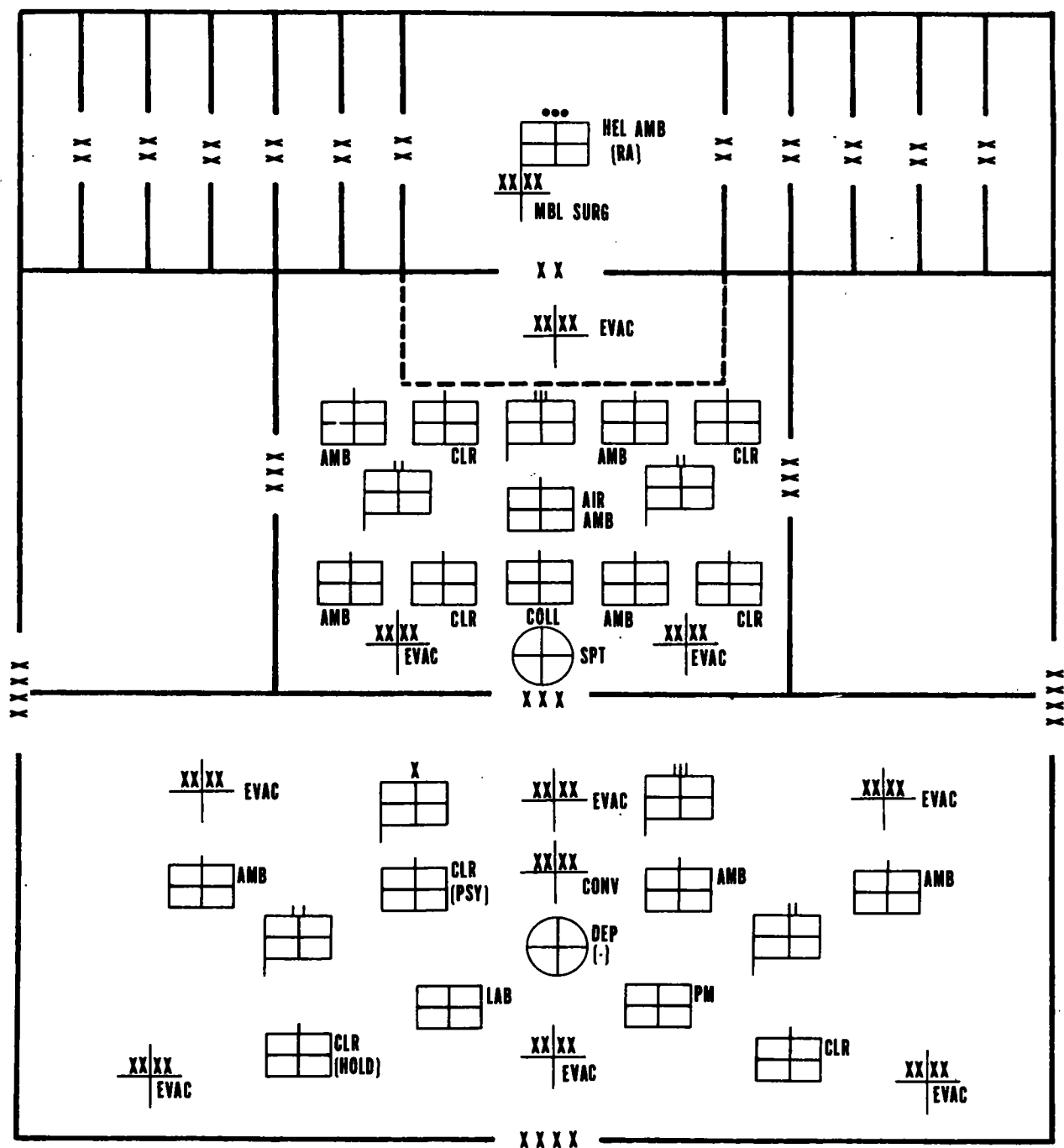


Figure 4-5

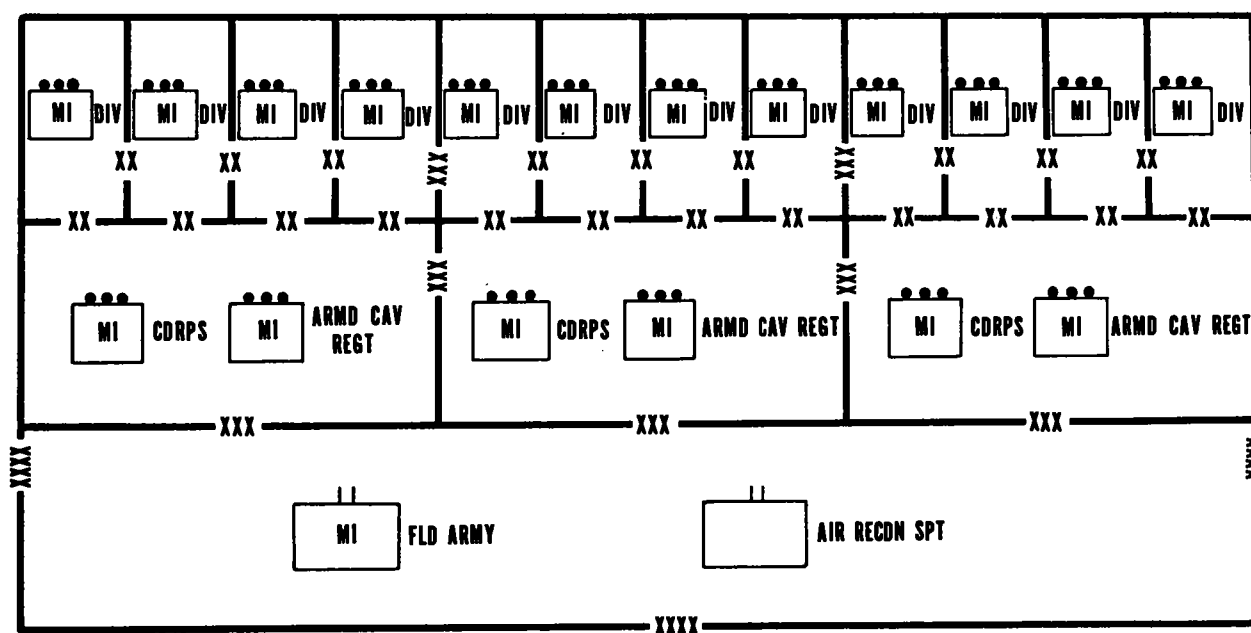
(8) *Military intelligence units.**(a) *Numbers and types—Military Intelligence units.*

1	2	3	4	5	6
Unit	TOE	TOE strength	Corps	Field army	Total field army
Air recon spt bn -----	30-5D	279	-----	1	1
MI bn, fld army (-) ¹ -----	30-25E	599	-----	1	1
MI det, corps or abn corps -----	30-18E	72	1	-----	3
MI det, div (w/aug) -----	30-17E	66	4	-----	12
MI det, A/C regt -----	30-14E	32	1	-----	3
MI teams ² -----	30-600D	(³)	-----	As required	-----

¹ Corps and division detachments are assigned elements of the military intelligence battalion, field army. The number of detachments assigned to a battalion depends upon the number of corps and divisions assigned to the particular field army. Therefore, these detachments are shown separately.

² The field army (or corps) functioning as the senior Army headquarters in the theater may require the assignment of teams from TOE 30-600D. Field armies and corps functioning as part of a larger Army force may receive augmentation teams, as required, of the following types: interrogation, interpreter, translator, order of battle, technical intelligence, strategic intelligence research and analysis, censorship and image interpretation.

³ Strengths will vary according to combination of teams employed

(b) *Schematic diagram—Military Intelligence units (fig. 4-6).*

(b) Schematic diagram—military intelligence units.

Figure 4-6

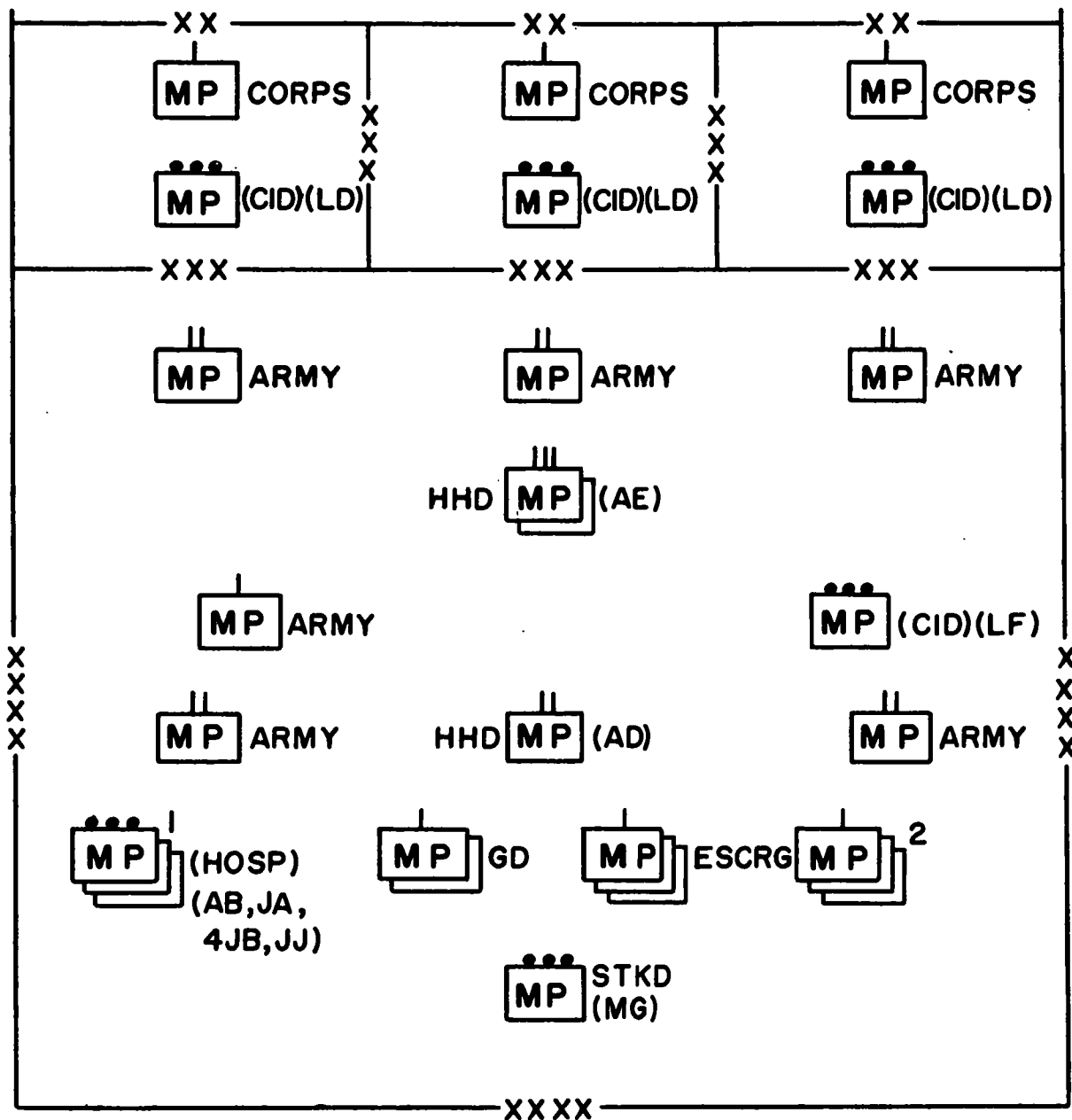
* For data pertaining to intelligence support activities, see FM 101-10-3, paragraph 4-16.

(9) *Military police units.*(a) *Numbers and types—Military Police units.*

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HHD, MP gp (AE) -----	19-500D	23	-----	2	2
3	HHD, MP bn (AD) -----	19-500D	20	-----	1	1
4	MP bn, army -----	19-35E	654	-----	5	5
5	MP co, corps, abn corps, or army -----	19-37E	198	1	1	4
6	MP ESCRG co -----	19-47E	141	-----	3	3
7	MP gd co -----	19-247C	124	-----	2	2
8	MP co ¹ -----	19-57E	130	-----	3	3
9	MP det, cnf (MG) -----	19-500D	32	-----	1	1
10	MP det, CID (LD) -----	19-500D	12	1	-----	3
11	MP det, CID (LF) -----	19-500D	26	-----	1	1
12	MP det (Hosp) (AB, JA, 4JB, JJ) -----	19-500D	26	1	-----	3

¹ Unit at reduced strength, attached to special ammunition unit in combat zone for security.

(b) Schematic diagram—Military Police units (fig. 4-7).



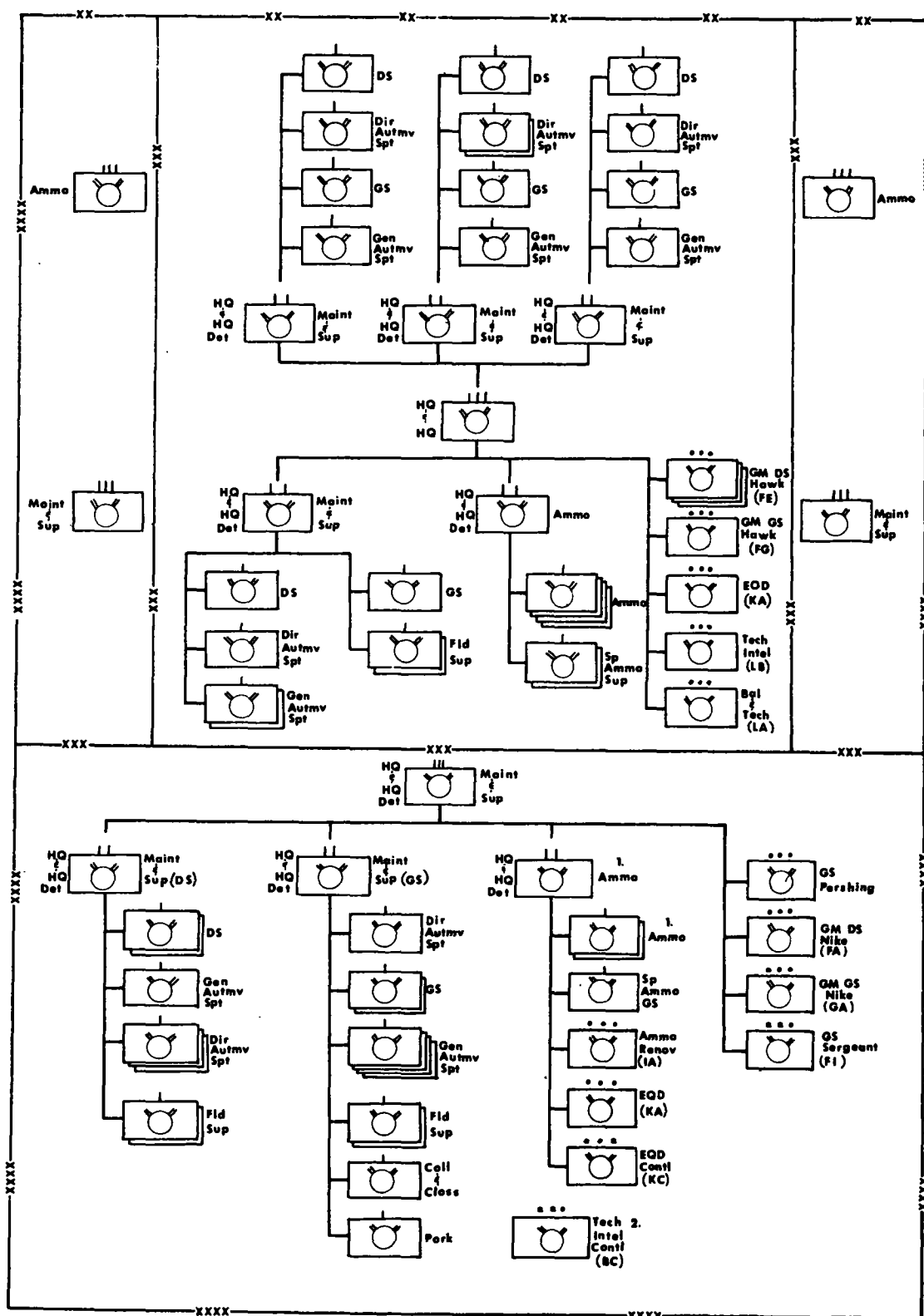
1. ATCHD TO CONVALESCENT CENTERS
2. ATCHD AT REDUCED STRENGTH FOR SPECIAL AMMUNITION SECURITY (TOE 19-57E)

Figure 4-7

(10) *Ordnance units.*(a) *Numbers and types—Ordnance units.*

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HQ & HQ co, ord ammo gp -----	9-22E	87	1	-----	3
3	HQ & HQ det, ord maint and sup gp -----	9-12E	54	1	1	4
4	HQ & HQ det, ord maint and sup bn -----	9-76D	37	4	6	18
5	HQ & HQ det, ord ammo bn -----	9-86E	72	1	3	6
6	Ord ammo co -----	9-17D	263	4	6	18
7	Ord coll & class co -----	9-167D	167	-----	3	3
8	Ord dir autmv spt co -----	9-127D	123	5	11	26
9	Ord DS co -----	9-7D	181	4	7	19
10	Ord fld sup co -----	9-57D	158	2	11	17
11	Ord sp ammo sup co -----	9-47D	246	2	-----	6
12	Ord det, Pershing GS -----	9-227P	47	-----	2	2
13	Ord gen autmv spt co -----	9-197D	185	5	15	30
14	Ord GS co -----	9-9D	201	4	5	17
15	Ord park co -----	9-137E	156	-----	1	1
16	Ord sp ammo gen spt co -----	9-87D	184	-----	3	3
17	Ord det, ammo renov (IA) -----	9-500D	65	-----	1	1
18	Ord det, ball & tech (LA) -----	9-500D	7	1	-----	3
19	Ord det, EOD (KA) -----	9-500D	10	1	2	5
20	Ord det, EOD cntl (KC) -----	9-500D	8	-----	1	1
21	Ord det, GM, DS, HAWK (FE) -----	9-510T	43	3	-----	6
22	Ord det, GM, DS, NIKE (FA) -----	9-500D	44	-----	3	3
23	Ord det, GM, GS, HAWK (FG) -----	9-500T	32	1	-----	3
24	Ord det, GM, GS, NIKE (GA) -----	9-500D	46	-----	1	1
25	Ord det, GS, SERGEANT (FI) -----	9-500T	45	-----	2	2
26	Ord det, tech intel (LB) -----	9-500D	6	1	-----	3
27	Ord det, tech intel, con (BC) -----	9-500D	11	-----	1	1

(b) Schematic diagram—Ordnance units (fig. 4-8).



1. The number of ammunition battalions and companies depends upon the tonnages to be handled and lifts to be involved.

2. Normally attached to a headquarters and headquarters company, ordnance group, in the field army service area.

(11) Quartermaster.

(a) Number and types—Quartermaster units (type mix).

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HQ & HQ det, QM gp -----	10-22E	44	1	3	6
3	QM Direct Support Bn -----	10-105D	599	3	3	12
4	HQ & HQ det, QM DS bn -----	10-106D	(31)	(3)	(3)	(12)
5	QM DS co -----	10-107D	(284)	(7)	(6)	(27)
6	QM GS bn -----	10-445D	1065	-----	3	3
7	HQ & HQ det, QM GS bn -----	10-446D	(34)	-----	(3)	(3)
8	QM Fld Depot co -----	10-447D	(268)	-----	(3)	(3)
9	QM Fld Maint and svc Co -----	10-448D	(268)	-----	(3)	(3)
10	QM Svc co -----	10-449D	(165)	-----	(9)	(9)
11	QM Petrl Prod Lab, MBL (KC) -----	10-500D	8	-----	1	1
12	QM Tech Intel det (LA) -----	10-500D	4	1	1	4

(b) Schematic diagram—Quartermaster units (fig. 4-9).

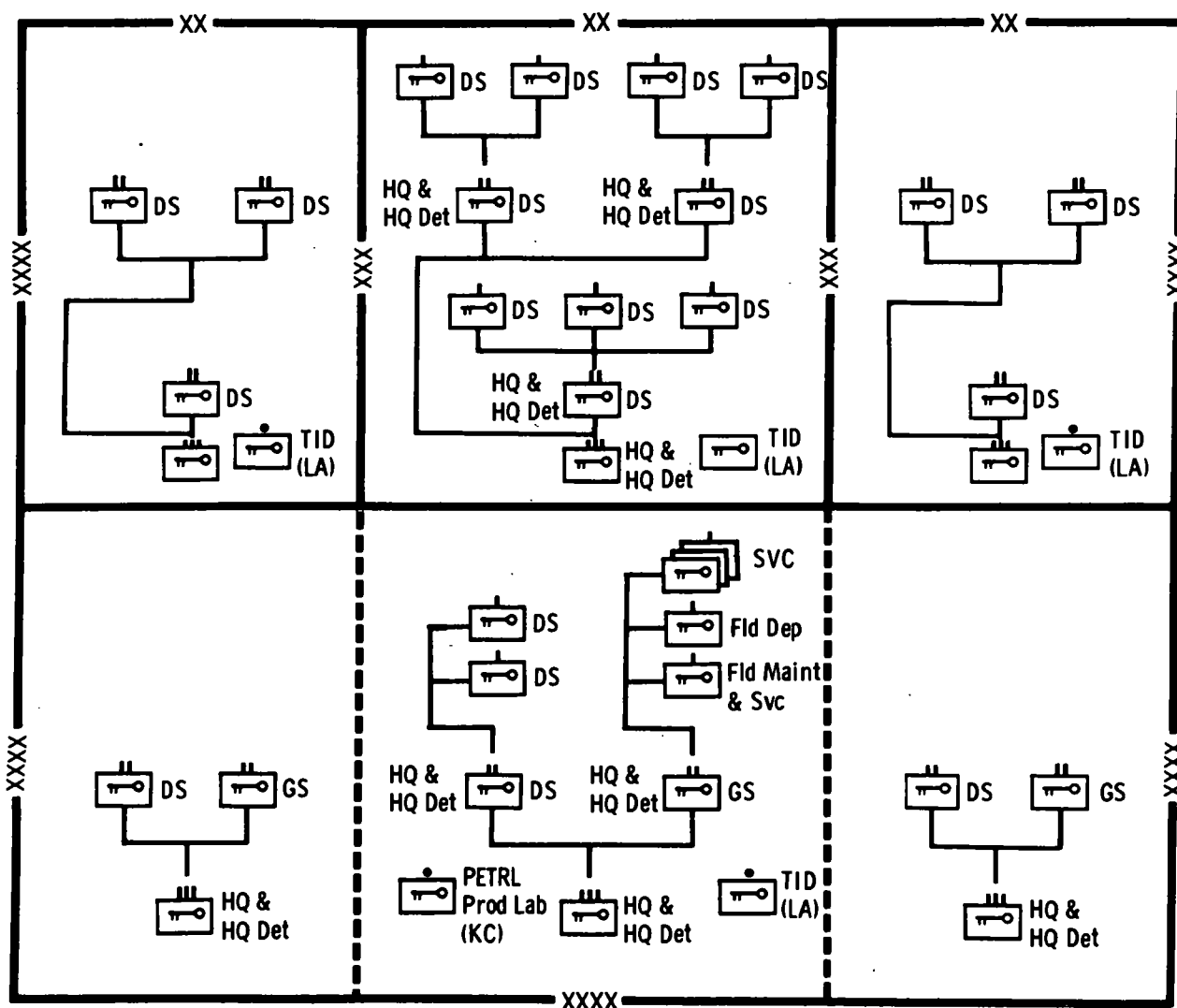


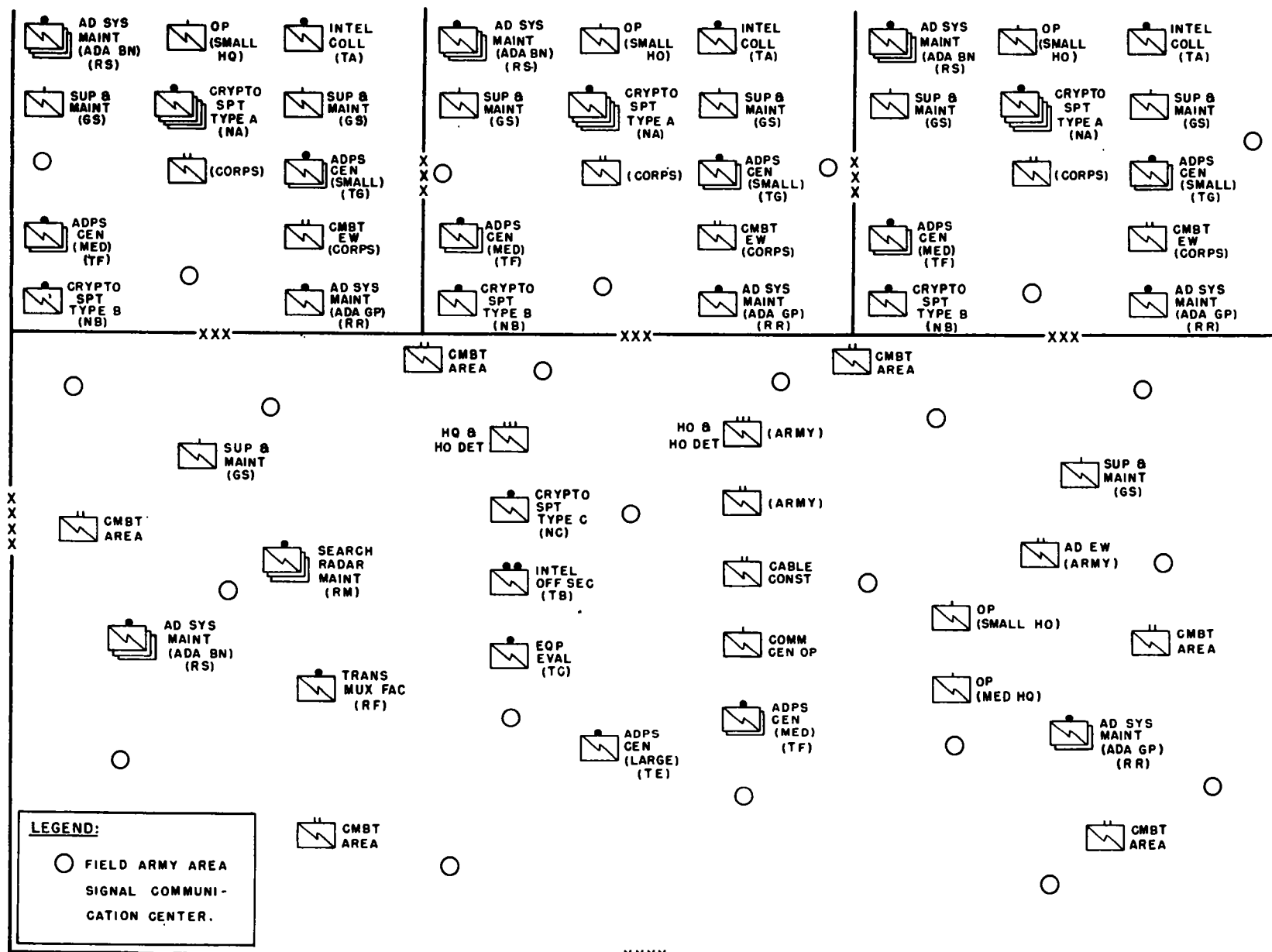
Figure 4-9

(12) *Signal units.*(a) *Numbers and types—Signal units.*

1	2	3	4	5	6
Unit	TOE	TOE strength	Corps	Field army	Total field army
2 Corps sig bn -----	11-15E	763	1	-----	3
3 HQ & HQ det, sig gp -----	11-22E	38	-----	1	1
4 HQ & HQ det, sig gp, army -----	11-32E	63	-----	1	1
5 Sig cable const bn -----	11-45D	875	-----	1	1
6 HQ & HQ det, cmbt EW sig bn, corps -----	11-66D	42	1	-----	3
7 Cmbt EW sig co, inf -----	11-67D	165	1	-----	3
8 Cmbt EW sig co, armd -----	11-68D	140	1	-----	3
9 Sig cmbt area bn -----	11-85E	815	-----	6	6
10 Army sig bn -----	11-96D	1114	-----	1	1
11 HQ & HQ det, sig gp -----	11-122F	49	-----	1	1
12 Sig op co, medium hq -----	11-127E	233	-----	1	1
13 Sig comm cen op co -----	11-137E	297	-----	1	1
14 Sig op co, small hq -----	11-147E	136	1	1	4
15 Sig sup & maint co (GS) -----	11-159E ¹	164	2	2	8
16 AD EW sig bn, army -----	11-165D	1071	-----	1	1
17 Abn corps sig bn -----	11-225E	722	1	-----	3
18 Team NA, crypto spt type A -----	11-500D	8	4	-----	12
19 Team NB, crypto spt type B -----	11-500D	20	1	-----	3
20 Team NC, crypto spt type C -----	11-500D	29	-----	1	1
21 Team RF, trans mux fac -----	11-500D	28	-----	1	1
22 Team RM, search radar maint -----	11-500D	5	-----	3	3
23 Team RR, AD sys maint (ADA gp) -----	11-500D	34	1	2	5
24 Team RS, AD sys maint (ADA bn) -----	11-500D	10	3	3	12
25 Team TA, sig intel coll -----	11-500D	4	1	-----	3
26 Team TB, sig intel off sec -----	11-500D	6	-----	1	1
27 Team TC, equip eval -----	11-500D	5	-----	1	1
28 Team TE, ADPS cen (large) -----	11-500D	34	-----	1	1
29 Team TF, ADPS cen (medium) -----	11-500D	25	2	2	8
30 Team TG, ADPS cen (small) -----	11-500D	12	2	-----	6

¹ Tentative TOE.

(b) Schematic diagram—Signal units (fig. 4-10).



XXXX
Figure 4-10

(13) *Transportation units.*(a) *Numbers and types—Transportation units.*

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	Trans gp, mov cont (1 AE, 1 LF, 6 LA, 7 LB, 5 LC, 5 LD) ¹	55-500R	210	-----	1	1
3	HQ & HQ co, trans trk grp -----	55-12D	61	-----	3	3
4	HQ & HQ det, trans acft sup & maint gp ² -----	55-	-----	-----	1	1
5	HQ & HQ det, trans acft maint & sup bn -----	55-456D	51	-----	4	4
6	HQ & HQ det, trans acft bn -----	55-56	72	-----	4	4
7	HQ & HQ det, trans mtr trans bn -----	55-16E	46	-----	9	9
8	Trans med hel co -----	55-58	178	-----	8	8
9	Trans acft co -----	55-59P	232	-----	3	3
10	Trans acft GS co -----	55-458E	272	-----	8	8
11	Trans acft DS co -----	55-457E	244	-----	11	11
12	Trans car co -----	55-19D	110	1	1	4
13	Trans lt trk co (2½-ton) -----	55-17E	173	-----	18	18
14	Trans lt trk co (5-ton) -----	55-17E	173	-----	9	9
15	Trans med trk co (cgo) -----	55-18E	192	-----	13	13
16	Trans med trk co (refrig) -----	55-18E	210	-----	1	1
17	Trans med trk co (petrl) -----	55-18E	192	-----	7	7
18	Trans hv trk co -----	55-28D	152	-----	4	4
19	Trans hwy reg pt (GG) -----	55-500R	8	-----	6	6
20	Trans intel-coll (HA) -----	55-500R	12	-----	1	1
21	Trans tlr transfer pt opg (GF) ³ -----	55-500R	16	-----	2	2
22	Trans LCL freight (BD) -----	55-500R	9	-----	3	3

¹ All teams plus or minus.² Proposed 55-series TOE when published.³ May operate for and be assigned to COMMZ.(b) *Schematic diagram—Transportation units (figs. 4-11)*

Figure 4-11

[Located in back of manual.]

(14) *Army Security units.*(a) *Numbers and types—Army Security Agency units.*

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HQ & HQ co, ASA gp -----	32-52D	257	-----	1	1
3	HQ & HQ co, ASA bn -----	32-56E	187	1	-----	3
4	ASA op co (A) -----	32-67E	347	-----	2	2
5	ASA co (proc) -----	32-77D	236	-----	1	1
6	ASA co (scty) -----	32-87D	133	-----	1	1
7	ASA div spt co—inf -----	32-57F	231	4	-----	12

¹ When in support of armd div, agg 288;

When in support of mech div, agg 288;

When in support of abn div, agg 281.

(b) Schematic diagram—U. S. Army Security Agency units. (fig 4-12).

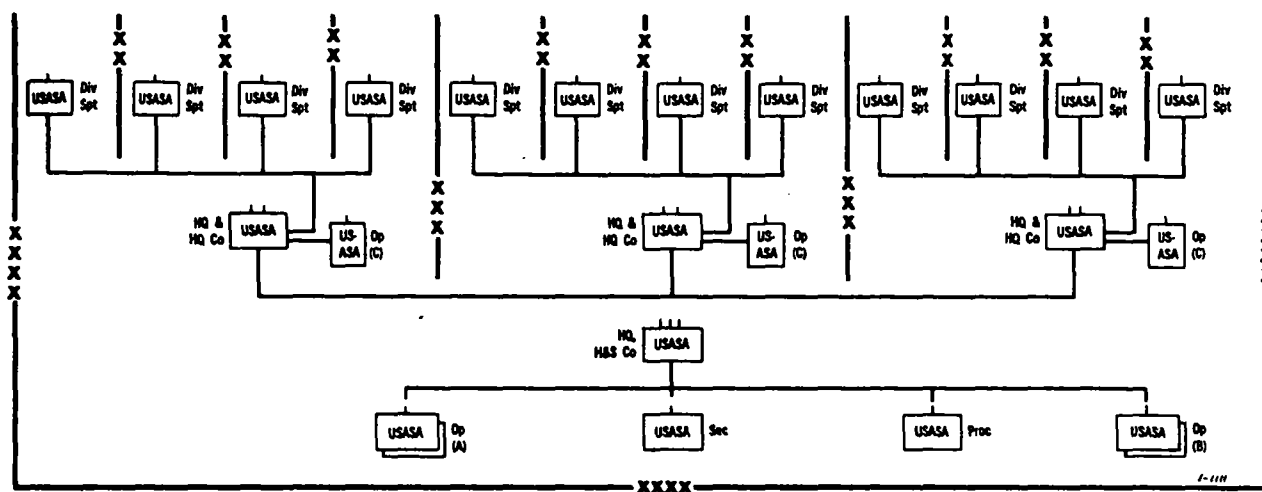


Figure 4-12

(15) Miscellaneous—numbers and types.

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
	Headquarters					
2	HQ, army (aug) -----	51-1D	1,105	-----	1	1
3	HQ co, army -----	51-2D	139	-----	1	1
4	HQ, sp trp, army -----	51-3D	18	-----	1	1
5	HQ, corps or abn corps -----	52-1D	249	1	-----	3
6	HQ co, corps or abn corps -----	52-2D	66	1	-----	3
	Replacement Units					
7	HQ & HQ det, repl gp -----	12-52D	53	-----	1	1
8	HQ & HQ det, repl bn -----	12-56D	55	1	1	4
9	Repl co -----	12-57D	32	4	4	16
	Adjutant General					
10	APU type F -----	12-605D	16	-----	14	14
11	APU type J -----	12-605D	35	-----	1	1
12	Data proc unit type Z (mbl) (aug) -----	12-510E	69	-----	3	3
13	Data proc unit type Z (consol aug) (mbl) -----	12-510E	78	-----	1	1
14	Army band (42-piece) -----	12-107E	43	1	1	4
15	Army band (28-piece) -----	12-107E	29	-----	3	3
16	Pstl reg det -----	12-47E	43	-----	2	2
17	SPS co -----	12-17D	103	1.25	-----	3.75
	Finance					
18	Fin disb sec (AC, FL, GA, HB) -----	14-500E	31	3	9	18
	Civil Affairs					
19	CA gp (AC, FD, GC, HB, IC, KB, LB, BA, BE, MC, NC, OB, PD, QB, RB, SB, TA, VA, VC, WC, XB). (CA, 2 CB, DA, DC, DE) -----	41-500D 29-500D	169	-----	1	1

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
20	CA co (AB, 10 AA, 10 FA, BE, FB, GB, IA, BA, MB, NA, NB, OA, PC, QA, RA, SA, VA, WB). (CA, 2 CB, DA, DC, 2 DE, DG) -----	41-500D	171	1	-----	3
21	CA plat (div) (AA, BA, FA, BD, MA, NA, VA). <i>Judge Advocate General Corps¹</i>	29-500D 41-500D	22	4	-----	12
22	JAGC det HQ team (AA) -----	27-500E	4	1	3	6
23	JAGC det HQ team (AB) -----	27-500E	9	-----	1	1
24	JAGC claims svc team (FA) -----	27-500E	4	3	3	12
25	JAGC claims svc team (FB) -----	27-500E	10	-----	2	2
26	JAGC war crimes team (GA) -----	27-500E	4	3	3	12
27	JAGC war crimes team (GB) -----	27-500E	5	-----	2	2
28	JAGC GCM trial team (HA) -----	27-500E	6	2	4	10
29	JAGC GCM trial team (HB) -----	27-500E	10	2	3	9
30	JAGC legal asst team (IA) -----	27-500E	3	2	4	10
31	JAGC legal asst team (IB) -----	27-500E	4	-----	1	1
	<i>Special Warfare²</i>					
32	Special Forces Gp (Airborne) -----	31-105E	1,573	-----	3	3
33	Hq & Hq co SF Gp (Airborne) -----	31-106E	219	-----	3	3
34	Special Forces co (Airborne) -----	31-107E	244	-----	12	12
35	Signal Company SF Gp (Airborne) -----	11-247E	183	-----	3	3
36	Aviation Company SF Gp (Airborne) -----	1-307E	195	-----	3	3
37	Hq & Hq co psych warfare broadcasting and leaflet bn.	33-56D	154	-----	1	1
38	Psych warfare reproduction det -----	33-57D	59	-----	1	1
39	Psych warfare Organization field or theater army.	33-500E	123	-----	1	1
40	Psych warfare consolidated organization -----	33-600D	96	-----	1	1
	<i>Historical</i>					
41	Mil hist det -----	20-17E	2	4	-----	12
	<i>Public Information</i>					
42	Pub info op team (BA) -----	45-500E	2	1	-----	3
43	Cmbt correspondent team (BD) -----	45-500E	1	4	-----	12
44	Pub info op team (aug) (BE) -----	45-500E	5	1	-----	3
45	Pub info op team (aug) (BF) -----	45-500E	3	1	1	4
46	Press camp HQ team (AA) -----	45-500E	7	-----	1	1

¹ Not basis for automatic allocation.² Psychological warfare TOE units will be superseded by TOE 33-500F.

4-3. Troop Requirements—Theater Army Logistical Command

a. There is no prescribed organization or type composition for the theater army logistical command. The theater army logistical command troop list should be specifically

tailored to efficiently perform the minimum essential support functions. Factors which influence the support structure in the theater army logistical command are as follows:

- (1) *Mission.* The mission of the theater determines in a large measure the

load which will be placed on the theater army logistical command.

- (2) *Supported strength.* The total strength to be supported, both combat zone and theater army logistical command personnel, influences both the size and types of support which must be provided. Included in these strength considerations must be the support requirements for Air Force, Navy (including Marine), Allied troops, and civil affairs personnel.
- (3) *Troop availability.* The availability of combat service support troops and supporting equipment will influence theater army logistical command organization.
- (4) *Geography, climate, and cultural development.* These factors affect the support levels required for the efficient conduct of military operations. Favorable climate and terrain tend to decrease many combat service support requirements; whereas, cultural developments may increase or decrease requirements, depending on the nature of military operations conducted.
- (5) *Concept of combat service support.* Just as the mission of the theater determines the load placed on the theater army logistical command, the combat service support concept employed will determine the efficiency of support services.

b. For data pertaining to the numbers and types of nondivisional combat service support units which might be found within the communications zone, see FM 101-10-3, paragraph 4-2. For data pertaining to the normal assignment, capabilities, and strengths of nondivisional combat service support units, see FM 101-10-2.

4-4. Troop Requirements—Airborne Operations

a. General.

- (1) The troop requirements for an airborne force are determined by the mission, the terrain in the objective area, enemy dispositions and capabilities,

probable length of time the airborne force must be supported by airlines of communications, the availability of combat service support, and other pertinent factors. The complete dependence of an airborne force on a single communication system—airlines of communication—until surface link-up is established requires that troop requirements be very carefully determined for each airborne operation being planned.

- (2) Normally the troop list for the Army component of an airborne force includes those units that will be directly employed in the operation in a combat or supporting role. It does not include units required to support the marshaling of the Army forces or the combat service support that may be furnished by the theater army logistical command agency designated to mount and support the airborne operation.
- (3) The number of airborne divisions and corps allocated to theaters of operation will vary. Such units will be furnished by the Department of the Army based on Joint Chiefs of Staff directives.
- (4) The Army component of an airborne force is usually responsible for its own combat service support in the airborne objective area, regardless of the size or composition of the Army forces. Therefore, the troop list for the Army component of an airborne force will contain sufficient service troops to provide combat service support in the airborne objective area. In all airborne operations, the provision of combat service support to the Army forces in the objective area by units located in the departure area will be carefully considered and used to the maximum extent permitted by the characteristics of the operation being planned. Usually the nature of the service provided by the units concerned will de-

termine whether they will be assigned to the Army component of the airborne force or to the theater army logistical command supporting the operation. Normally the number of Army combat service support troops required in an airborne objective area will be considerably less than the number employed by a ground force containing the same number of divisions.

b. Employment of TOE UNITS. The same types of nondivisional combat service support troops shown for the type field army in paragraph 4-2 will be used to support airborne divisions, infantry divisions, corps, and field armies used in airborne operations. The number of supporting units used will be scaled down to provide only the requirements of the specific force being organized. Frequently the strength and organic equipment of a supporting unit will be reduced to enhance its air transportability. Lighter equipment may be substituted for heavy equipment. Because of the inherent differences between ground and airborne operations many of the units shown in paragraph 4-2 may be omitted from the airborne troop list, while others may be assigned to the theater army logistical command agency supporting the airborne operation. Of those units assigned to the Army component of the airborne force, a portion may operate within the objective area, while others will support the operation from the departure area.

c. Employment of Special Units. Special units or TOE units with special training and equipment are required for certain airborne operations, particularly those of the independent type.

- (1) Specifically tailored, trained, and equipped engineer units organized primarily around the engineer light equipment company and the engineer combat battalion (Army) are required when airfields are to be rehabilitated or air-landing facilities constructed.
- (2) Specially organized, trained, and equipped to provide air terminal facilities in the objective area when large tonnages of supplies and equipment

will be delivered by air for a prolonged period. Normally this support will be provided by Air Force units.

- (3) The numbers and types of the special units required will be determined separately for each airborne operation, based on such factors as the airfield repair and construction requirements in the objective area, the tonnage of supplies and equipment to be received in the objective area via air transportation, and the method of supply distribution that will be used in the objective area.

4-5. Troop Requirements—Amphibious Operations

The table below is designed for use in determining the units required in addition to the units normally attached to brigade landing teams, (BdeLT) divisions, and corps to provide balanced shore parties for an amphibious operation. Troop assignment (in the table) is based on a corps with three divisions in the assault. The factors used as a basis for determining the troop requirements can only be used to provide an estimate of requirements. Modifications and adjustments must be made to meet the peculiarities of a particular situation.

4-6. Troop Planning Slices (fig. 4-13 and 4-14)

a. Purpose. In administrative planning, a preliminary estimate of the total size of a force is required to determine the final composition and the ultimate size of the force, since the required number of many service units, such as hospitals, depot units, etc., bears a direct relationship to the size of the total force. Two factors are used in such planning, the *division slice* and the *wing slice*. To determine the preliminary total of the force, multiply the division slice by the number of divisions in the force and add the product thus obtained to that of the wing slice multiplied by the number of wings in the force; to the sum thus obtained must be added the various miscellaneous forces not included in either slice.

A Type Shore Party Troop List

1	2	3	4	5
Unit	TOE	Per corps 1,2	Per Inf div 1,2	Per BdeLT 1,2
<i>Engineer units:</i>				
2 HQ & HQ co, engr amph bde -----	5-401	-----	-----	1
3 HQ & HQ co, engr amph gp -----	5-402	-----	1	3
4 Engr amph bn -----	5-405	1	2	6
<i>Chemical units:</i>				
Cml smoke genr bn:				
5 HQ & HQ det, cml smoke genr bn -----	3-266	-----	1	3
6 Cml smoke genr co -----	3-267	1	-----	-----
7 Cml direct spt co -----	3-7	-----	-----	1
8 Plat, cml direct spt co -----	3-7	-----	1	-----
<i>Medical units:</i>				
Med bn, sep:				
9 HQ & HQ det, med bn, sep -----	8-26	-----	-----	1
10 Med coll co -----	8-129	-----	1	3
11 Med holding co -----	8-57	-----	-----	1
12 Med amb co -----	8-127	-----	1	3
13 Med air amb co -----	8-137	-----	-----	1
<i>Ordnance units:</i>				
Ord gp:				
14 HQ & HQ co, ord gp -----	9-12	-----	-----	1
Ord maint and sup bn:				
15 HQ & HQ det, ord maint and sup bn -----	9-76	-----	1	4
16 Ord DS co -----	9-7	-----	1	5
17 Ord dir autmv spt co -----	9-127	-----	1	4
18 Ord fld sup co -----	9-57	-----	-----	3
19 Ord tech intel det (LB) -----	9-510	-----	1	3
20 Ord GM DS and GS dets -----	9-510	-----	As required	-----
Ord gp:				
21 HQ & HQ co, ord ammo gp -----	9-22	-----	-----	1
Ord ammo bn:				
22 HQ & HQ det, ord ammo bn -----	9-86	-----	-----	1
23 Ord ammo co -----	9-17	-----	1	4
24 Ord sp ammo sup co -----	9-47	-----	-----	1
25 EOD det (KA) -----	9-500	-----	1	3
<i>Signal units:</i>				
26 Sig fwd sup and maint co, army sig sup and maint bn. -----	11-157	-----	-----	1
27 Det, sig fwd sup and maint co -----	11-157	-----	1	-----
28 Sig co, sep -----	11-500	-----	-----	1
29 Plat, sig co, sep -----	11-500	-----	1	-----
<i>Quartermaster units:</i>				
30 HQ & HQ det, QM gp -----	10-22	-----	-----	1
31 QM dir spt bn -----	10-105	-----	-----	2
32 QM dir spt co -----	10-107	-----	1	10
33 QM gen spt bn -----	10-445	-----	-----	1
34 QM svc co ⁴ -----	10-449	-----	2	8
35 Plat, QM svc co -----	-----	1	-----	-----
36 QM cemetery det (JF) ⁵ -----	10-500	-----	1	2
37 QM plat hq det (AB) ⁶ -----	10-500	-----	-----	6
38 QM petrl bulk distr det, mbl (KF) -----	10-500	-----	-----	6
39 QM petrl bulk distr det, augm (KG) ⁶ -----	10-500	-----	-----	6
40 QM petrl bulk stor & iss det, smbl (KC) ⁶ -----	10-500	-----	-----	6

See footnotes at end of table.

A Type Shore Party Troop List—Continued

1	2	3	4	5
Unit	TOE	Per corps ^{1,2}	Per Inf div ^{1,2}	Per BdeLT ^{1,2}
Transportation units:				
Trans terminal bn:				
41 HQ & HQ det -----	55-116		2	6
42 Trans lt amphib -----	55-138	1	3	9
43 Trans med amphib -----	55-139	1	3	9
44 Trans hv amphib plt -----	55-500	1	3	9
45 Trans term svc co -----	55-117	1	3	9
46 Trans amph DS det -----	55-510	3	1	3
47 Trans amph GS co -----	55-158		1	3
Trans truck bn:				
48 HQ & HQ det, mtr trans bn -----	55-16			1
49 Trans lt trk co -----	55-17		1	3
50 Trans acft DS co -----	55-457			1
Trans mov bn:				
51 Bn HQ & trans mov dets (AD, LA, 2-LE).	55-500			1
52 Trans mov dets (3-LC, 3-LD) -----	55-500		6	18
Military police units:				
53 MP bn, army -----	19-35		1	4
54 MP co, army -----	19-37		1	
55 Plat, MP co -----	19-37	2		
56 HHD, MP bn (AD) -----	19-500			1
57 MP ESCRG co -----	19-47		1	4
58 Plat, MP ESCRG co -----	19-47	1		
59 MP gd co -----	19-247			1
Civil affairs units:				
60 CA co (AB, 4AA) -----	41-500D			1
61 CA plat (AA, BA, MA, NA, RA, VA) -----	41-500D	1	1	4
Navy units:				
62 Nav beach gp -----	USN		1	3
63 Aslt det, nav beach gp -----	USN	1		
64 Air Force units -----			(³)	(³)

¹ TOE units shown under columns 4 and 5 can be broken down and assigned to support subordinate commands as the situation may require.

² Figures in column 4 include those in column 3; figures in column 5 include those in column 4.

³ Air Force service elements to support Air Force units with the landing force.

⁴ Three (3) companies are organic to QM gen spt bn (line 36) and five (5) are separate companies.

⁵ It is assumed that dispersion of landing zones will require separate beach cemetery operations in support of each assault division. Cemetery plat, QM gen spt bn will support one division, two (2) TOE 10-500 cemetery dets will support the two remaining divisions.

⁶ Bulk POL support will be provided for a maximum of 4 BdeLT's per division. Six (6) BdeLT's will be supported by elements of QM dir spt bns and QM gen spt bn; and six (6) BdeLT's will be supported by petri plats comprised of TOE 10-500 cellular detachments.

b. Definitions.

- (1) The *division slice* includes the strength of an average combat division plus proportionate shares of the total corps, field army, communications zone, and CONUS (for world-wide slice only) units operating to the rear of the division (and of Naval units directly supporting the Marines in case of Marine divisions). The division slice for any given force is

equal to the total strength of the force divided by the number of combat divisions in the force.

- (2) The *wing slice* includes the strength of an average wing plus a proportionate share of the Air Force and Army units engaged in developing or operating the airbases (and of Naval units which directly support the Marine or Naval air units).

c. *Relation Between Division Slice and Wing Slice.* The 7,000-man wing slice includes about 1,000 Army communications zone men not counted in a division slice. These 1,000 Army men are required for communications zone support of Air Force units and installations present in the theater of operations. In the charts in *d* below, and also in *a* and *b* above, this same assumption is made—the wing slice and not the division slice contains the com-

munications zone support for Air Force. This allows troop planners to use these tables with varying ratios of air wings to Army divisions in any specific force.

d. *Basic Slice Factors.* (See para 5-49 and 9-2 for location of slice components as contrasted with assignment of slice components shown here.)

(1) *Division slice.* (U.S. Army troops only).

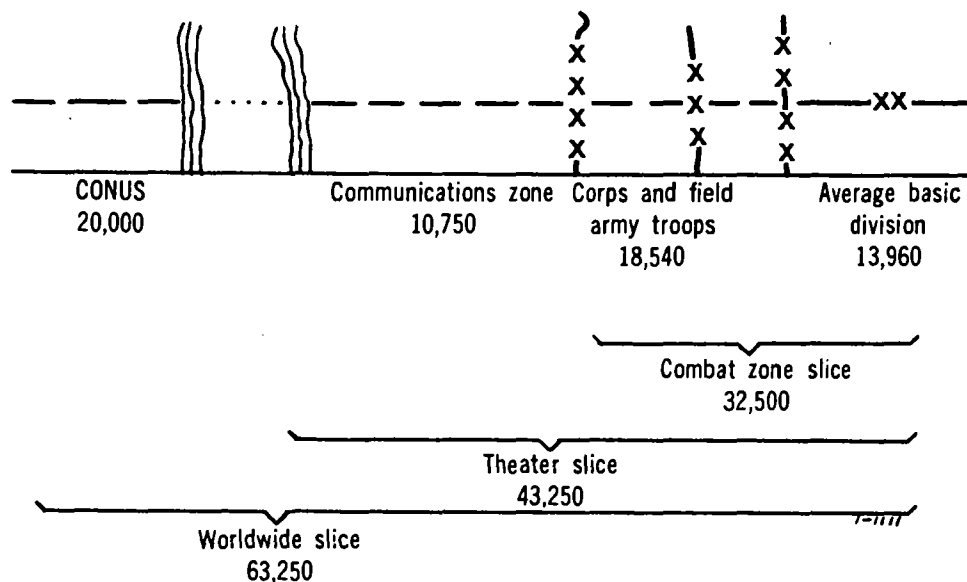


Figure 4-13

(2) *Wing slice.* (U.S. Air Force combat service and support troops and U.S. Army troops present, because Army supports Air Force in certain functions):

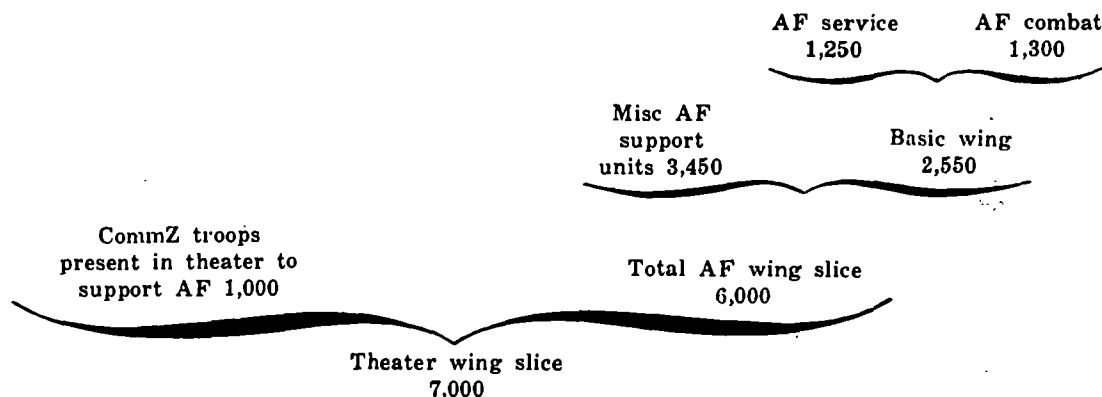


Figure 4-14

4-7. Division and Wing Slices

a. Division Slice. The following table presents the percentages of each arm, service, and other major grouping in each part of a large balanced force. It is based on troop deployment at the end of World War II. This troop deployment contained 89 divisions—5 airborne, 16 armored, 1 cavalry, 66 infantry, and 1 mountain. This table has been modified to conform to the current type field army, current divisions and the consolidation of all artillery in one arm, the consolidation of cavalry, armored, and tank destroyer units into one armor branch, the transfer of certain truck and car units from Quartermaster Corps to Transportation Corps, and the separation of the Air Force from the Army. The communications zone column does *not* include those Army communications zone troops who must be present to support the Air Force (para 4-6*b* and *c*).

Division Slice

1	Branch or other major groupings	Worldwide slice		Theater slice		Combat zone slice		Average division only (13,960 men)
		Total (63,250 men)	CONUS portion (20,000 men)	(Army)		(Army)		
				Total (43,250 men)	CommZ portion (10,750 men) ¹	Total (32,500 men) ²	Corps, fld army, and rear portion (18,540 men) ²	
2	Combat division -----	22.1	0.0	32.3	0.0	43.0	0.0	100.0
3	HQ units, AG, FD, and other administrative and intelligence services including operating overheads (including for CONUS defense command overheads and DA agencies) -----	5.5	9.5	3.7	8.4	2.6	4.6	0.0
4	Armor -----	3.5	0.3	5.2	0.1	6.2	10.9	0.0
5	Artillery -----	9.2	1.6	13.6	0.1	17.2	30.9	0.0
6	Aviation -----					1.1	20.0	
7	Chemical -----	0.5	0.2	0.6	0.7	0.6	1.0	0.0
8	Engineer -----	7.7	4.0	9.0	12.0	8.6	15.0	0.0
9	Infantry -----	1.5	0.4	2.3	0.2	1.7	2.9	0.0
10	Medical -----	5.9	4.9	6.5	16.0	3.9	6.8	0.0
11	Military police -----	1.1	0.9	1.2	2.0	1.1	1.9	0.0
12	Ordnance -----	5.0	1.8	6.0	6.9	5.3	9.1	0.0
13	Quartermaster -----	4.7	2.6	5.6	14.7	2.8	4.9	0.0
14	Signal -----	3.8	1.7	4.3	7.0	3.1	5.2	0.0
15	Transportation -----	5.6	5.0	6.0	16.2	2.8	4.8	0.0
16	Replacements -----	10.0	23.0	3.7	¹ 15.7	² (2.3)	² (4.9)	0.0
17	Bulk pers CONUS only -----	8.8	27.9	0.0	0.0	0.0	0.0	0.0
18	Misc CONUS only -----	5.1	16.2	0.0	0.0	0.0	0.0	0.0
19	Total percentage -----	100.0	100.0	100.0	100.0	100.0	100.0	100.0
20	Percentage of worldwide slice -----	100.0	31.6	68.4	17.0	51.4	29.3	22.1
21	Percentage of theater slice -----			100.0	24.8	75.2	42.9	32.3
22	Percentage of combat zone slice -----					100.0	56.9	43.0

¹ Includes replacements in field army areas.

² Does not include replacements.

³ Not included in field army percentage total.

b. Wing Slice. The table below presents the percentages of components, branch, and other major groupings present in the theater of operations. It is based upon a hypothetical USAF troop list and a hypothetical Army force.

Theater Wing Slice

	1	2	3	4
	Component, branch, or other major grouping	Theater total—7,000 men (percentage)	Air Force total—6,000 men (percentage)	Basic wing 2,550 men—(1,300 combat) (1,250 service) ¹ (percentage)
1				
	Air Force:			
2	HQ and overhead ² -----	(3.0)	(3.3)	-----
3	Combat -----	18.6	21.7	51.0
4	Service -----	17.9	20.8	49.0
5	Misc support -----	49.2	57.5	-----
	Army:			
6	CommZ support -----	14.3	-----	-----
7	Total percentage -----	100.0	100.0	100.0
8	Percentage of wing slice -----	100.0	85.7	36.4

¹ Located on the combat airfield; includes all elements organic to wing.

² Includes various Air Force headquarters and miscellaneous overhead units. Percentages in parentheses are included within total percentages of miscellaneous support, line 5.

Army Communications Zone Support by Service

	HQ and misc overhead	Cml	Engr	Med	Ord	QM	Sig	Trans	Total
Percentage of 1,000 men.	10	2	22	20	5	16	8	17	100

Section II. TACTICAL TROOP MOVEMENTS**4-8. General**

a. Introduction. The examples of forms for movement tables and graphs are included as guides for the preparation of similar tables for units in the field. Tables for field use must conform to the variations of strength of units and the amount of transportation and equipment available. Brigades, separate battalions, and similar units should maintain tables showing road space requirements of their units, based on actual strength and materiel on hand. Reports of subordinate units form the basis for tables of larger units. Tables of normally attached units are maintained by brigade headquarters. However, a table based on actual strength of men and materiel may be worthless without proper evaluation of the weather, road aspects, nuclear aspects, hostile air and

mechanized threats, or other variable factors affecting the troop movement. These basic figures are capable of great increase or decrease under extremes of the variable factors. In considering movement data under nuclear conditions, consideration should be given to the relatively unprofitable target presented by a narrow, long column and the possible high vulnerability of several columns along parallel routes at the same time. Troop movement data as given in the examples of tables of basic road spaces and tables of rates and lengths of marches are average from field experience.

b. Basic Road Spaces. The following values apply in computing road spaces, except when greater dispersion is desired to reduce the effect of unfavorable factors such as those mentioned in paragraph 4-8a.

(1) *Foot troops (at halt or marching):*¹

	2 meters per man	5 meters per man
Single file, per man--	2.4	5.4
Column of twos, per man -----	1.2	2.7

(2) *Motor elements (at halt):*²

	Road space (meter) ³
Car, passenger -----	7
Armored, personnel carrier -----	6
Tank -----	10
Tank, with cargo carrier or weapon in tow -----	13
Tractor -----	7
Tractor, with cargo trailer or weapon in tow -----	14
Tractor, 5-ton, with semitrailer, 15-ton, low-bed -----	28
Tractor, 10-ton, with semitrailer, tank transporter, 50-ton -----	28

Trucks:

	Road space (meter) ³
¼-ton -----	4
¼-ton with cargo trailer or weapon in tow -----	8
½- or ¾-ton -----	6
½- or ¾-ton, with cargo trailer or weapon in tow -----	9
2½-ton -----	8
2½-ton, with cargo trailer or weapon in tow -----	15
Over 2½-ton -----	9
Over 2½-ton with cargo trailer in tow -----	15
6-ton cargo (treadway) -----	13
10-ton, with 8-inch Howitzer ---	21
5-ton, with 155-mm Howitzer ---	15
Pershing, XM474, SP -----	5
5-ton tractor, with Sergeant XM504 -----	17
Average per vehicle for a mixed column of various types -----	10

(3) *Use of values.*

- (a) A dismounted battalion of 800 men organized as 4 companies, totaling 19 platoons; company distances—100 meters; platoon distances—50 meters; formation—column of twos, 5 meters between men:

$$\begin{aligned} \text{Road space} &= 800 \times 2.7 + 3 \times \\ &100 + 18 \times 50 = \\ &2560 \text{ meters} \end{aligned}$$

- (b) A mixed motor column consisting of—

20 trucks, ¼-ton, with
weapons in tow at
8 meters each ----- 160

25 trucks, ¾-ton, with
trailer in tow at 9
meters each ----- 225

40 trucks, 2½-ton, with
trailers in tow at
15 meters each ----- 600

40 tanks at 10 meters
each ----- 400

125 total

Total road space at
halt ----- 1,385

Alternate solution

((2) above):

125 vehicles (mixed)
at 10 meters each --- 1,250

¹ For time length of foot elements in column, see paragraph d below. Factors do not include normal distances between units.

² For road spaces and time lengths for motor elements at various rates of march, see paragraph 4.10e below.

³ Allows 1 to 2 meters between vehicles. See chapter 5 for actual lengths of vehicles, towed weapons, and trailers.

c. Halts (Motor March).(1) *Short halts.*

- (a) The observance of routine short halts will be at the discretion of the commander controlling road movement over the route in question.
- (b) A halt of 15 minutes is normally made at the end of the first hour. Thereafter a 10-minute halt is normally made after each 110-minutes running time.

(2) *Long halts.*

- (a) One-half to 1 hour is allowed for mess and refueling stops. When it is known that other convoys must pass, a mess and refueling halt should be scheduled to coincide with the passing, thus using the necessary delay to an advantage.
- (b) Long halts must be specifically authorized and plotted on movement graphs.
- (c) For detailed information pertaining to operational road movement orders, tables, and graphs see FM 55-35.

d. Time Lengths of Columns on Foot—Column of Twos, 5 Meters Per Man (does not include unit intervals). (fig. 4-15.)

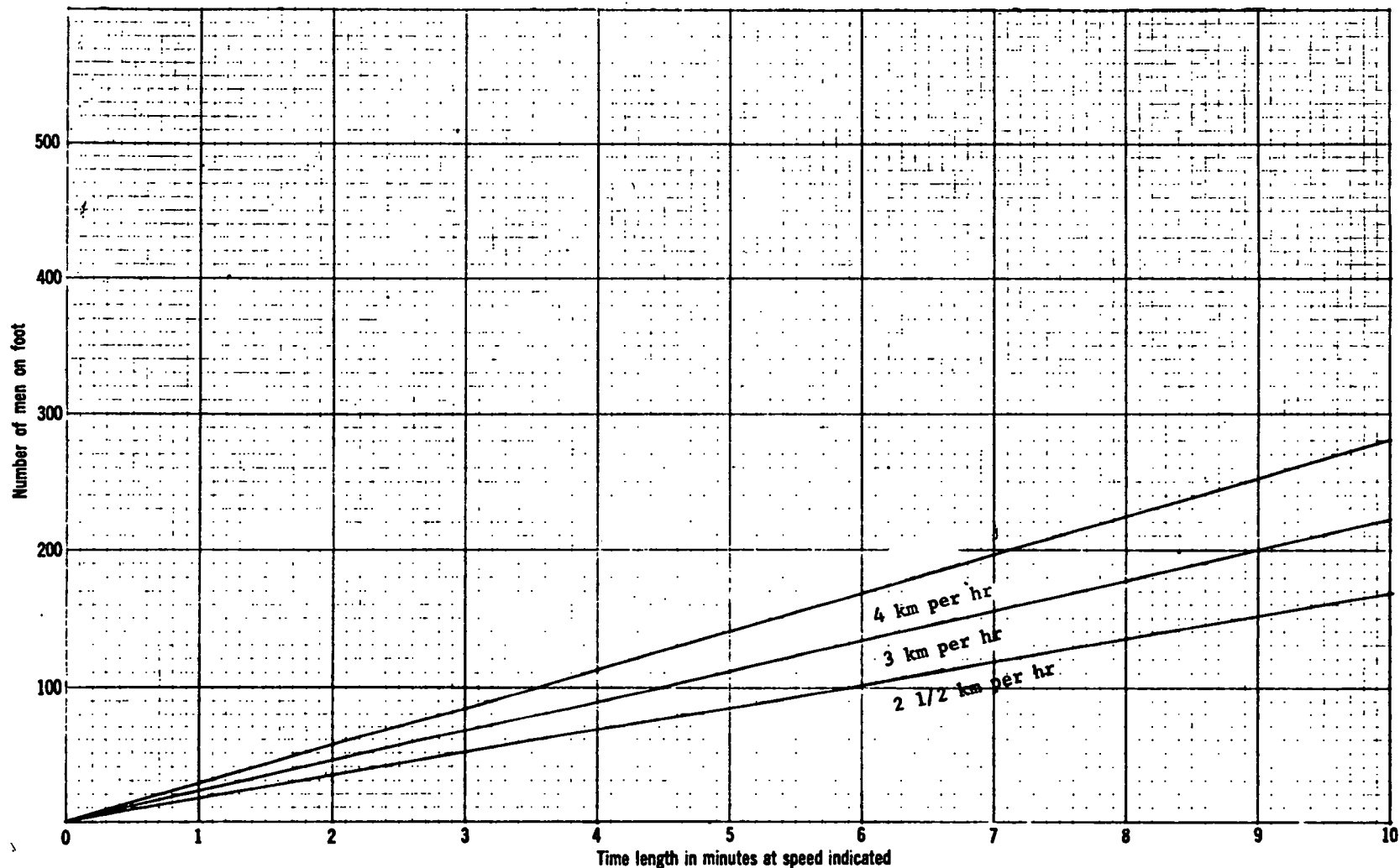


Figure 4-15

e. Rates and Lengths of Road Movements, Foot and Motor Elements.¹

(1) The following rates and lengths of marches are based upon modern vehicles, trained personnel, and favorable conditions of roads and weather:

	1	2	3	4	5	6	7
1	Unit	Rates of march (KPH) ²				Lengths of march on roads (km per day, average) ⁴	Remarks
		On roads ³		Cross country			
		Day	Night	Day	Night		

INFANTRY⁵

2	Foot Troops -----	4	3	2½	1½	19-24 for a division; 24-32 for smaller units.	Length of march increased with well-seasoned troops marching on good roads in favorable weather when required by the tactical situation.
---	-------------------	---	---	----	----	---	--

ARTILLERY

3	Truck-drawn, light or medium.	40	40 (light) 16 (no lights)	12	8	280	
4	Truck-drawn, heavy.	29	29 (lights) 16 (no lights)	10	6	216	
5	Tractor-drawn, heavy.	24	24 (lights)	10	6 (lights) 1½ (no lights)	216	
6	Air defense arty, missile.	32	32 (lights) 16 (no lights)	8	3	281	
7	Air defense arty, self-propelled.	32	32 (lights) 16 (no lights)	19	8	281	

ARMOR

8	Tanks, light, and armored carriers	32	32 (lights) 16 (no lights)	24	8	240	Armored division moves at rate of march of main battle tanks.
9	Tanks, main battle--	28	24 (lights)	16	4½	160	

MISCELLANEOUS

10	Infantry division, motorized.	24	24 (lights) 16 (no lights)	-----	-----	240	Single vehicles or small columns of less than 50 vehicles.
11	Trucks and ambulances not carrying patients.	40	40 (lights) 16 (no lights)	-----	-----	240	
12	Ambulance carrying patients.	24	16 (lights)	8	8	215	
13	Cars, passenger ----	55	55 (lights) 16 (no lights)	-----	-----	400	

¹ The rate of march of a column of elements with different rates of march is regulated by that of the slowest elements.

² Rate of march is average speed over a period of time, including short, periodic halts.

³ Rates of march for motorized elements listed in columns 2 and 3 are possible only on improved roads.

⁴ Greater distances than those given in column 6 may be covered under forced-march conditions.

⁵ For movement over mountainous terrain, an additional allowance of 1 hour should be made for each 300 meters of climb.

(2) *Road movements in snow and extreme cold.*

- (a) *Foot.* Foot troops marching in snow without snowshoes or skis will have their mobility decreased. The decrease of mobility will depend on several factors, among which are depth and nature of the snow. Normally, snow of a depth of 64 centimeters or more will prohibit marching unless skis or snowshoes are used. For specially equipped and adequately trained troops, the following rates of march are practicable:

Snowshoes ----- $2\frac{1}{2}$ to 4 km per hour.

Skis ----- $2\frac{1}{2}$ to $5\frac{1}{2}$ km per hour.

Small bodies of well-trained troops are capable of moving 64 km a day on skis, under favorable conditions.

- (b) *Motor movement (wheel) in snow.*

Depth snow (cm)	Measures required for movement
7.5-----	None.
15-----	Rear chains.
15-45-----	Chains all around; and special traction devices on leading vehicles (to break the trail).
45 and over-----	Snowplow required.

f. Forced Marches of Foot Elements. For planning purposes, a normal foot march covers 32 km per day at a rate of 4 km per hour. A forced march requires the expenditure of more than the normal effort in speed, exertion, hours marched, or a combination of these. Although forced marches impair the fighting efficiency of a unit, urgent conditions on the battlefield may require a maximum effort. Full advantage should be taken of those periods when the troops are most rested to increase the rate of march. Rest periods should be scheduled to avoid marching at extremely hot times of the day and to insure the arrival of the unit in effective condition to fight.

g. Vehicle Capacities for Personnel. The capacity of motor transportation for movement of foot troops depends upon the rated capacity of the transportation employed, the type of body on the vehicles, the method of carrying

personnel, and the distance personnel are to be moved. Normal capacities for trucks carrying personnel with hand-carried weapons, packs and extra ammunition, with no additional cargo, and excluding driver, are—

	Men
Armored personnel carrier -----	11
Truck, $\frac{1}{4}$ -ton -----	3
Truck, $\frac{3}{4}$ -ton -----	9
Truck, $2\frac{1}{2}$ -ton -----	20
Semitrailer, 12-ton -----	50

Note. When $2\frac{1}{2}$ -ton engineer dump trucks carry the loads shown above, some personnel will be required to stand; 12-ton semitrailers should be used to haul troops only in emergencies.

h. Tabulating Number of Trucks Required for Movement by Motor Transport. The following format may be used to tabulate the approximate number of trucks required to move foot elements with individual equipment.

	1	2	3	4	5
	Unit	Actual strength	Transported in organic motors	Strengths for which transportation must be furnished	Number of $2\frac{1}{2}$ -ton trucks required
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

4-9. Basic Terms and Formulas

a. Traffic Flow of Motor Columns. Traffic flow is defined as the total number of vehicles passing a given point in a given time. Traffic flow is expressed in vehicles per hour and can

be determined for any route by the following formula:

Traffic flow in vehicles per hour = Density in vehicles per km $\times$ speed in km per hour $\times$ F.

F (a variable) depends upon the standing operating procedure time intervals between march units and serials applicable in the area and on the overall state of proficiency of units operating in the area in motor movement and traffic control. For adaptation to a specific area under field conditions, it is necessary that time and space studies be conducted continuously in order to arrive at a suitable factor. This study may result in a basic factor to which allowance for time interval between march units and serials must be added, or a basic factor including allowance for time interval between march units and serials.

b. Density of Motor Columns.

- (1) Density is defined as the number of vehicles per kilometer of road space occupied by vehicles. Motor columns may be classified as either close column, open column, or infiltration.

(a) *Close column.* In close column, vehicles are closed to safe driving distance behind the preceding vehicle. Usually a fixed speedometer multiplier (SM)* is specified (such as 2, 3, 4, etc.) to accomplish a safe-driving intervehicular distance at all speeds.

(b) *Open column.* In open column, distances between vehicles are increased to accomplish greater dispersion. Usually a fixed distance (such as 90 or 180 meters between vehicles) is specified, but open-column conditions may be obtained by designating a fixed SM high enough to insure the desired intervehicular gap at the lowest speed expected.

(c) *Infiltration.* In infiltration, vehicles are dispatched at irregular inter-

vals with a fixed density (such as 3, 4, 5, or 6 vehicles per km).

- (2) To determine the density of a motor column, when the speed and SM are known, use the following formula:

$$\text{Density} = \frac{1,000 \text{ (meters per km)}}{\text{Speed (km)} \times \text{SM}}$$

Example. With a speed of 20 km and an SM of 2, vehicle density equals—

$$\frac{1,000}{20 \times 2} = 25 \text{ vehicles per kilometer.}$$

c. Road Space (RS).

- (1) Road space is defined as the length, expressed in units, of a column on the road. Road space is the sum of the lengths of the vehicles, the distance between vehicles, and the distance between march elements.
- (2) The road space occupied by a motor column may be obtained when the number of motor vehicles in the column disregarding trailers and towed weapons), the average density (number of vehicles per km), and the total of the time intervals between subordinate units are known.

$$\begin{aligned} \text{Road space (km)} = & \frac{\text{Number of motor vehicles}}{\text{Density (vehicles per km)}} + \\ & \frac{\text{time intervals (min)} \times \text{speed (km per hour)}}{60} \end{aligned}$$

An approximation of road space may be determined by the following:

$$\begin{aligned} \text{Road space (km)} = & \text{Number of vehicles} \div 75 \text{ (less than 25 vehicles in close column).} \\ = & \text{Number of vehicles} \div 30 \text{ (25 or more vehicles in close column).} \end{aligned}$$

* For logistical purposes, SM is any number by which speed in kilometers per hour is multiplied to determine the gap between successive vehicles in meters.

Example. With an SM of 2, the gap between successive vehicles at a speed of 15 kilometers per hour is $2 \times 15 = 30$ meters; at a speed of 40 km per hour, it is $2 \times 40 = 80$ meters.

- = Number of vehicles ÷ 20 (less than 25 vehicles in open column).
- = Number of vehicles ÷ 15 (25 or more vehicles in open column).
- = Number of vehicles ÷ 3 (any number of vehicles marching by infiltration).

In close column, a 15-minute time interval occupies 4.0 km of road space and in open column 6.0 km of road space.

d. Time Length (TL). The time length of a column is the time required for the column to pass a given point. The time length may be determined by the following formula:

$$\text{Time length (min)} = \frac{\text{Road space (km)} \times 60}{\text{Speed (km per hr)}}$$

An approximation of time length may be determined by the following:

$$\begin{aligned} \text{Time length (min)} &= \text{Number of vehicles} \times 0.08 \text{ (less than 25 vehicles in close column).} \\ &= \text{Number of vehicles} \times 0.18 \text{ (25 or more vehicles in close column).} \\ &= \text{Number of vehicles} \times 0.20 \text{ (less than 25 vehicles in open column).} \\ &= \text{Number of vehicles} \times 0.30 \text{ (25 or more vehicles in open column).} \\ &= \text{Number of vehicles} \times 1.33 \text{ (any number of vehicles marching by infiltration).} \end{aligned}$$

Add 1 minute per 25 vehicles to the time length of each serial.

e. Time Distance (TD). Time distance is defined as the time required for any one individual or vehicle to travel between two given

points. Time distance may be determined by the following formula:

$$\text{Time distance (TD)} = \frac{\text{Distance (D)}}{\text{Rate of march (R)}}$$

f. Road and Time Interval (RI and TI).

- (1) Road interval is defined as the distance between march elements. The road interval between march elements is more significant when the column is moving than when the column is halted; therefore, it is generally prescribed as a factor of time rather than distance. (See (2) below.) Road interval may be determined by the following formula:

$$\begin{aligned} \text{Road interval (RI)} &= \\ &\frac{\text{Time interval (min)} \times \text{rate (km per hr)}}{60} \end{aligned}$$

- (2) Time interval may be considered as the conversion of road interval to time. There are no prescribed standard intervals. These will depend on the size of serials and march units, the time available for the movement, as well as the tactics required for protection against air and nuclear attack. All divisions (type) when moving by motor in a tactical march, may move in up to six march columns—one serial per brigade, one serial for division artillery, one serial for division troops, and one serial for the support command. These march columns are subdivided into battalion serials and march units of company, troop or battery size. Example of time intervals between these march elements are as follows:

Between march columns (brigades, division artillery, division troops and support command)—15 minutes.

Between serials (battalion size)—5 minutes.

Between march units—2½ minutes.
(See FM 61-100.)

4-10. Aids to Planning

a. The detailed work of planning troop movements can be simplified by preparing in advance tables, graphs, and other aids, based on statistical data and experience factors of the unit. The most important of these aids are—

- (1) Tables of simplified formulas for road space and time length.
- (2) Tables of precalculated road space and time length.
- (3) Road space and time length nomographs.
- (4) Unit table of road space and time lengths.
- (5) Tables of time distances.
- (6) Tables of average time factors.

- (7) Road movement graphs.
- (8) Road movement tables.
- (9) Strip map.
- (10) Vehicle availability tables.
- (11) Vehicle assignment tables.
- (12) March calculators.

b. *Example of Tables of Simplified Formulas for Road Spaces and Time Lengths.* This table is based on the infantry division. A time interval of 21½ minutes between company march units (21½ minutes per 25 vehicles) has been allowed for and built into the formulas. Time interval between serials has *not* been included. Similar tables for other units can easily be constructed, keeping in mind the number of time intervals to be built into the formula.

Columns formation	Rate (km per hr)	Density (veh/km)	Number of serials	Number of vehi- cles in serial	Road space (km)	Time length (min)
Close column.....	16	48	One	25 or less	0.0208V	0.08V
				More than 25	0.048V	0.18V
			Two or more	25 or less	0.0208V +4.0	0.08V/15I
				More than 25	0.048V +4.0	0.18V/15I
Open column.....	24	12	One	25 or less	0.08V	0.2V
				More than 25	0.12V	0.3V
			Two or more	25 or less	0.08V +6.0	0.2V/15I
				More than 25	0.12V +6.0	0.3V/15I
Infiltration.....	24	2	NA	Any number	0.5V	1.25V

V = number of vehicles.

I = number of intervals between serials of brigade size.

DERIVATION OF SIMPLIFIED FORMULAS

1. Forty-eight vehicles per km is the density employed when marching in *close column* formation; therefore, each vehicle in a continuous march element occupies a road space of 0.0208 km. The company-size march unit (averaging 25 vehicles or less) is assumed to be the continuous march element. This vehicular road space, when multiplied by the total number of vehicles (25 or less) in the column, gives the value for the road space of the column.

$$\text{RS for one vehicle} = 0.0208 \text{ or } \frac{V}{48} \text{ km.}$$

The road space for one vehicle can be converted to time length, using the equation, $TL = \frac{RS}{R}$ as follows:

$$TS = \frac{0.0208}{16} \times 60 \text{ (to convert to min)} =$$

$$0.0788 = 0.08 \text{ minutes.}$$

The constant, 0.08, when multiplied by the total number of vehicles (25 or less) in the column, computes the time length of the column.

$$TL = 0.08V \text{ min}$$

2. If a *close column* serial consists of more than 25 vehicles, the time intervals between subordinate march units must be considered in the calculations. This is done by converting this time interval, 2½ minutes per 25 vehicles, to 0.10 minute per vehicle and adding this value to the constant, 0.08.

$$TL = 0.18V \text{ min}$$

This value of TL can be converted into road space as follows:

$$TL = \frac{RS}{R}$$

$$RS = TL \times R$$

$$RS = 0.18V \times \frac{16}{60} = 0.048V \text{ km}$$

3. Twelve vehicles per kilometer is the density employed when marching in *open column* formation; therefore, each vehicle occupies a space of 0.08 km. For a continuous element, then—

$$RS \text{ for one vehicle} = 0.08 \text{ or } \frac{V}{12} \text{ km}$$

The road space for one vehicle can be converted to TL as follows:

$$TL = \frac{0.08}{24} \times 60 \text{ (to convert to min)} = 0.2 \text{ min}$$

The constant, 0.2, when multiplied by the total number of vehicles (25 or less), computes the TL of the column.

$$TL = 0.2V \text{ min}$$

4. If an *open column* serial consists of more than 25 vehicles, the time interval between subordinate march units, 0.10 minute per vehicle, must again be considered. Thus—

$$TL = 0.3V$$

This value of TL can be converted as in paragraph 2, above.

5. Whenever a column (*open* or *close*) consists of 2 or more march serials of brigade size, the 15-minute time interval between these serials must be considered in calculations.

Example:

$$TL = 0.18V$$

$$R = 16 \text{ km per hr}$$

$$T = 60 \text{ min}$$

$$I = 15 \text{ min}$$

Close column

$$RS = TL \times \frac{R}{T} + \frac{I \times R}{T} = 0.18V \times \frac{16}{60} + \frac{15 \times 16}{60}$$

$$= 0.48V + 4.0 = \text{km of RS}$$

6. Two vehicles per kilometer is the density employed when marching by *infiltration*; therefore, each ve-

hicle occupies a road space of 0.50 kilometers. This road space, when multiplied by the total number of vehicles, gives the road space of the column.

$$RS = 0.5V \text{ or } \frac{V}{2} \text{ km}$$

The road space can be converted to TL as follows:

$$TL = \frac{.5}{24} \times 60 = 1.25 \text{ min}$$

c. Example of a Table of Precalculated Road Spaces and Time Lengths. (This example is based on simplified formulas, *b* above.)

Part I—Movement of Less Than 25 Vehicles

Number of vehicles in the column	Road space (kilometers)		Time length (minutes)	
	Close column 48 veh/km 16 km per hr	Open column 12 veh/km 24km per hr	Close column 48 veh/km 16 km per hr	Open column 12 veh/km 24km per hr
1	0.0208	0.08	0.08	0.20
2	0.0416	0.16	0.16	0.40
3	0.0624	0.24	0.24	0.60
4	0.0832	0.32	0.32	0.80
5	0.1040	0.40	0.40	1.00
6	0.1248	0.48	0.48	1.20
7	0.1456	0.56	0.56	1.40
8	0.1604	0.64	0.64	1.60
9	0.1872	0.72	0.72	1.80
10	0.2080	0.80	0.80	2.00
20	0.4160	1.60	1.60	4.00

Part II—Movement of 25 or More Vehicles

Number of vehicles in the column	Road space (kilometers)		Time length (minutes)	
	Close column 48 veh/km 16 km per hr	Open column 12 veh/km 24km per hr	Close column 48 veh/km 16 km per hr	Open column 12 veh/km 24km per hr
1	0.048	0.12	0.18	0.3
2	0.086	0.24	0.36	0.6
3	0.144	0.36	0.54	0.9
4	0.192	0.48	0.72	1.2
5	0.240	0.60	0.90	1.5
6	0.288	0.72	1.08	1.8
7	0.336	0.84	1.26	2.1
8	0.384	0.96	1.44	2.4
9	0.432	1.08	1.62	2.7
10	0.480	1.20	1.80	3.0
20	0.960	2.40	3.60	6.0
30	1.440	3.60	5.40	9.0
40	1.920	4.80	7.20	12.0
50	2.400	6.00	9.00	15.0
60	2.880	7.20	10.80	18.0
70	3.360	8.40	12.60	21.0
80	3.840	9.60	14.40	24.0
90	4.320	10.80	16.20	27.0
100	4.800	12.00	18.00	30.0

See footnotes at end of table.

Number of vehicles in the column	Road space (kilometers)		Time length (minutes)	
	Close column 48 veh/km 16 km per hr	Open column 12 veh/km 24km per hr	Close column 48 veh/km 16 km per hr	Open column 12 veh/km 24km per hr
200	9.600	24.00	36.00	60.0
300	14.400	36.00	54.00	90.0
400	19.200	48.00	72.00	120.0
500	24.000	60.00	90.00	150.0

Illustrations of use.

PROBLEM. Determine the time length of 2 infantry brigades, one with 4 battalions consisting of 500 vehicles and the other of 3 battalions of 350 vehicles, moving as one march column in close column formation.

ANSWERS. Add the following from the above table:

TL for 800 vehicles = 144.00 minutes.

TL for 50 vehicles = 9.00 minutes.

TI = 40 minutes (15.00 minutes between brigades and 5 minutes between battalion size serials).

TL = 193.00 minutes for 350 vehicles.

Note. 2½-minute time intervals between company-size march units have been allotted for and built into the values in the table.

d. Road Space and Time Length Nomograph (fig. 4-16).

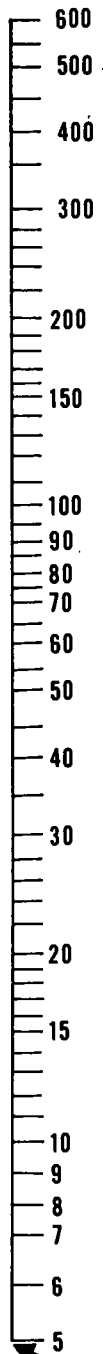
- (1) The following nomograph shows average road spaces and time lengths under ideal conditions and does *not* include allowance for time intervals between march units. Actual road space and time length may vary somewhat, depending on conditions.
- (2) To determine road space—
 - (a) Determine the number of motor vehicles in column, disregarding trailers or towed weapons.
 - (b) Locate the figure on vertical scale at left of chart, marked "Number of vehicles."

- (c) Locate the figure showing average density under which the movement will be made on the vertical scale marked "Density (veh/km)."
 - (d) Connect these two points with a straightedge. Read the figure at the point of intersection of the straightedge with the vertical scale marked "(Road space (kilometers))."
 - (e) This will be the road space, in km, occupied by the column under the given conditions.
- (3) To determine time lengths—
- (a) Obtain road space as directed in (2) above.
 - (b) Locate the figure representing the speed in km per hour on the vertical scale marked "Speed (km per hr)."
 - (c) Connect these two points with a straightedge.
 - (d) Read the figure at the intersection of the straightedge with the vertical scale marked "Time length."
 - (e) This figure is the time length of the column under the conditions given.

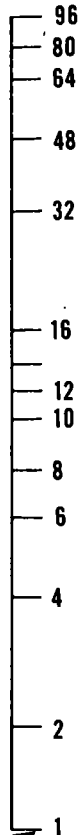
*e. Example of Format for a Unit's Table of Road Spaces and Time Lengths.** This format has been prepared for the infantry division. By use of appropriate TOE and the basic formulas contained in *b* above, complete tables can be prepared for any unit.

[Located in back of manual]

NUMBER
OF
VEHICLES



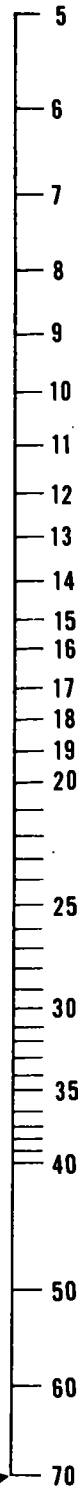
ROAD
SPACE
(KM)



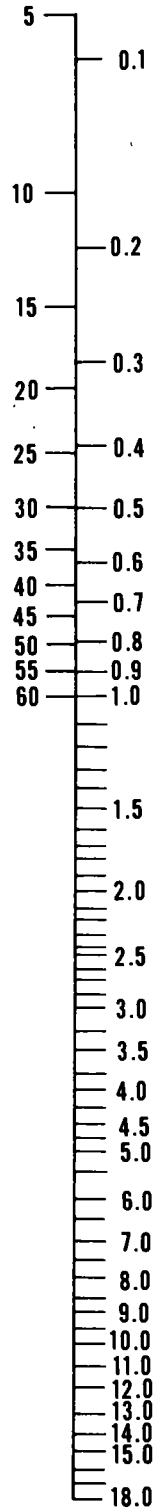
SPEED
(KM PER HR)



DENSITY
(VEH, KM)



TIME LENGTH
(MINUTES) (HOURS)



STEP TWO

Connect with straightedge; read time length.

STEP ONE

Connect with straightedge; read road space.

Figure 4-16

f. *Example of a Table of Time Distances* (fig. 4-17). Precomputed tables of time distances for routine rates of march will simplify calculations. An example of such a table, based on 15 kilometers per hour, is as follows:

Distance traveled 	0	1	2	3	4	5	6	* 7 	8	9
0	0	4	8	12	16	20	24	28	32	36
10	40	44	48	52	56	60	64	68	72	76
20	80	84	88	92	96	100	104	108	112	116
30	120	124	128	132	136	140	144	148	152	156
40	160	164	168	172	176	180	184	188	192	196
50	200	204	208	212	216	220	224	228	232	236
60	240	244	248	252	256	260	264	268	272	276
70	280	284	288	292	296	300	304	308	312	316
80	320	324	328	332	336	340	344	348	352	356
90	360	364	368	372	376	380	384	388	392	396
100	400	404	408	412	416	420	424	428	432	436
110	440	444	448	452	456	460	464	468	472	476
120	480	484	488	492	496	500	504	508	512	516
130	520	524	528	532	536	540	544	548	552	556
140	560	564	568	572	576	580	584	588	592	596
150	600	604	608	612	616	620	624	628	632	636
160	640	644	648	652	656	660	664	**668	672	676
170	680	684	688	692	696	700	704	708	712	716
180	720	724	728	732	736	740	744	748	752	756
190	760	764	768	772	776	780	784	788	792	796
200	800	804	808	812	816	820	824	828	832	836
210	840	844	848	852	856	860	864	868	872	876
220	880	884	888	892	896	900	904	908	912	916
230	920	924	928	932	936	940	944	948	952	956
240	960	964	968	972	976	980	984	988	992	996
250	1,000	1,004	1,008	1,012	1,016	1,020	1,024	1,028	1,032	1,036
260	1,040	1,044	1,048	1,052	1,056	1,060	1,064	1,068	1,072	1,076
270	1,080	1,084	1,088	1,092	1,096	1,100	1,104	1,108	1,112	1,116
280	1,120	1,124	1,128	1,132	1,136	1,140	1,144	1,148	1,152	1,156
290	1,160	1,164	1,168	1,172	1,176	1,180	1,184	1,188	1,192	1,196
300	1,200	1,204	1,208	1,212	1,216	1,220	1,224	1,228	1,232	1,236

** Illustrations of use.

Figure 4-17

PROBLEM. What is the time distance of a vehicle moving between points A and B, which are 167 km apart, at a rate of 15 kilometers per hour?

ANSWER. Enter left-hand column at 160, move across to the vertical line under 7, and read the time distances of 668 minutes directly from the table.

g. *Average Time Factors—Infantry Division.*

- (1) These data pertain to G3 time factors considered after an infantry division

receives a movement order. They give the times required by the command for—

- (a) Making preparations before the leading vehicle can arrive at the start point.
- (b) Completing the motor march and making preparations to launch a coordinated attack.
- (2) The preparations before the leading vehicle can arrive at the start point include transmission of orders by division; assembling trucks; spotting trucks; map reconnaissance of routes, detrucking areas, and assembly areas; issue of extra ammunition; briefing of troops; and other normal preparations for an anticipated movement. This preparation pertains to the *first* trip, whether the division is completely motorized by the attached transportation and moves in one trip or whether the division moves by organic transportation in two or more trips (echelon). The earliest time in which the leading vehicle can pass the start point after receipt of the order by the division commander is—

Hours

- (a) If the order was received in daylight for a daylight march (*for example*, received at 1000), leading vehicle can cross the start point at 1130----- 11½
- (b) If the order was received at night for a night march (*for example*, received at 2200), leading vehicle can cross the start point at 2400 ----- 2
- (c) If the order was received in daylight for a night march (*for example*, received at 1100), leading vehicle can cross at start point 1 hour after EENT ----- 1 hour after EENT

Hours

(For EENT, see para 3-16c.)

- (d) If the order was received at night for a daylight march, and more than 2 hours prior to BMNT (*for example*, received at 0200), leading vehicle can cross the start point at BMNT ----- (For BMNT, see para 3-16c.)

BMNT

(If the order was received less than 2 hours prior to BMNT, the time is the time the order was received plus 2 hours.)

Note. To determine corresponding time factors for a foot march rather than a motor march use ½ hour less in (a), (b), and (c) above.

- (3) The factors considered in computing time for an infantry division to complete a march and to make preparations for launching a coordinated attack are dependent on whether the march is made by echelon or completed in one trip. The time factors in (a), (b), (c), and (d) below are applicable only when the march is made by echelon. The time factors shown in (e), (f), (g), (h), and (i) below apply to any motor move and outline the procedure used in determining the earliest time at which an infantry division can launch a coordinated attack. These factors are based on the assumption that the infantry division can launch a coordinated attack when each of the brigades participating in the coordinated attack is in position behind the line of departure. Since the closing of these brigades requires more time than the preparation and movement of the other forces, supporting units, such as artillery, reserves, etc., will be in position prior

to closing of the brigades on the line of departure. The factors are further based on the assumption that these assault forces will be the leading elements of the road movement serials.

	Day	Night
(a) Dump basic loads	15 min	30 min
(b) Load basic loads	30 min	60 min
(c) Reassemble trucks for each trip made in convoy. -----	20 min	40 min
(d) Entruck personnel	10 min	20 min
(e) Complete the motor march from the old area to the new area. -----	See above.	

Note. If the release point (RP) is 5 km or less from the detrucking point (DP), time distance will be the time to complete the move from the start point to RP. Any consideration of time consumed in moving by motor from the RP to the DP in the new area is included in the time factors given in (g) below. If the distance is over 5 km from RP to DP, the time to traverse this distance must be added to the time required to complete the move from the start point to the RP before considering the time factor for detrucking troops in (f) below.

	Day	Night
(f) Detruck, reform foot troops -----	5 min	10 min
(g) Organization and movement in the new assembly area prior to troops reaching the foot start points for the foot march to the line of departure. (This includes movement from the RP as outlined in (e) above as well as time to issue any additional rations or ammunition car- ried in each truck transporting troops.) -----	30 min	60 min

- | | | |
|---|--------------------------|--------|
| | Day | Night |
| (h) Time to move from
foot start points in
the new area to line
of departure (time
distance of foot
march) ----- | See paragraph
4.8e(1) | |
| (i) Time for final prep-
aration after the
leading man reaches
the line of depart-
ure and prior to
launching a coordi-
nated attack. (This
factor includes time
to close foot troops
behind the line of
departure, time to
reconnoiter, issue
orders in subordi-
nate units, and em-
place and register
infantry weapons
where necessary.) | 60 min | 90 min |

h. Average Time Factors—Armored Division.

- (1) These data pertain to G3 time factors considered after an armored division receives a movement order. They give the times required by the command for—
 - (a) Making preparations before the leading vehicle can arrive at the start point.
 - (b) Completing the motor march and making preparations to launch a coordinated attack.
- (2) The preparations before the leading vehicle can arrive at the start point are less time consuming than in the infantry division since the armored division is able to move the entire division by organic vehicles. Preparations include transmission of orders by division, briefing of troops, and other normal preparations for an anticipated move. It is SOP for armored division vehicles to be refueled and ex-

pending ammunition replaced at once whenever a halt is made or any element of the division enters an assembly area, thus permitting vehicles to move as soon as personnel and equipment are loaded.

Hours

- (a) If the order was received in daylight for a daylight march (*for example*, received at 1000), leading vehicle can cross the start point at 1045 ----- $\frac{3}{4}$
- (b) If the order was received at night for a night march (*for example*, received at 2200), leading vehicle can cross the start point at 2300 ----- 1
- (c) If the order was received in daylight for a night march (*for example*, received at 1100), leading vehicle can cross the start point 30 minutes after EENT ----- 30 minutes after EENT

(For EENT, see para 3-16c.)

- (d) If the order was received at night for a daylight march, and more than 1 hour prior to BMNT (*for example*, received at 0200), leading vehicle can cross start point at BMNT ----- BMNT

(See para 3-16c). (If order was received less than 1 hour prior to BMNT, the time is the time the order was received plus 1 hour.)

- (3) The factors considered in computing time for an armored or a mechanized division to complete a march and to make preparations for launching a coordinated attack are dependent upon whether the division is organized for combat. It is assumed that the division is organized for combat in anticipation of the move and commitment to battle. The time factors in (b) and (c) below apply to any move and are based on the assumption that the armored division can launch a coordinated attack when two task forces (equivalent of one infantry battalion and one tank battalion) of each brigade are in position to attack. If the division formation is a column of brigades, only the time factors for the leading brigade are computed. If the division formation is brigades abreast, the time factors for the brigade with the greatest distance to traverse are computed as the factors for the entire division. If the division is not organized for combat, time must be allowed (as included in (a) below) to permit battalions and supporting units to assemble under a brigade and organize into task forces under the brigade commander. Other commands, such as the brigade in reserve, division troops, division artillery, support command, and units placed in division troops, can be assumed to complete their organization in less time than a brigade and therefore are not included as a factor. The organization of brigades and task forces may be partially or entirely completed either in bivouac, assembly area or attack position, or a combination thereof. The time factor, however, remains the same.

Day Night

- (a) Organize brigades and task forces. (In either one or combination of bivouac, assembly area and

	Day	Night
attack position, and attack position.) --	45 min	1 hr 30 min
(b) Complete march from old area to new area -----	See (3) above	
(c) Time for final re- connaissance, re- fueling, and prep- arations to cross the line of depart- ure or leave attack position (may be a combined assembly area attack posi- tion -----	30 min	1 hr

i. *Road Movement Graphs.*

- (1) A road movement graph is the simplest method of obtaining data required for a road movement table or order. It shows the approximate location at any hour of the head or tail of each serial, providing the road movement proceeds as scheduled. The vertical scale to the left, with point of origin at the bottom, serves as a distance scale in kilometers and should show the relative locations, along the route, of critical points where coordination of the movement is required. The horizontal scale provides a time scale in hours, beginning at the left with the earliest hour at which the first serial may start the march.
- (2) A serial is represented graphically by drawing a line to represent the movement of the head of the serial and a line to represent the movement of the tail of the serial. The lines are parallel and are drawn with a slope that represents the rate of march. (At 10 kilometers per hour, the slope equals 10 kilometers on the vertical to 1 hour on the horizontal scale.)

(3) *Example of road movement graph.*

- (a) The 1st Infantry Division commander has directed that elements of the division support command and the 1st brigade move under cover of darkness from their present bivouacs, areas A and B, to areas C and D. Foot troops and motor vehicles will move during the night 16-17 October. Movement is to begin 161900 October and is to be completed 170430 October.

(b) Road movement graph (fig. 4-18).

j. *Road Movement Table.*

- (1) *General.* A road movement table is normally published as an annex to the march or operation order. The road movement table contains information and instructions concerning the march serials involved in the movement, their serial numbers, rates of march, routes, start points, times of crossing the start points, release points, critical points, times of arrival at or departure from critical points, and other pertinent details. This information is usually obtained from an accurate knowledge of the status of routes and units and from a road movement graph (fig. 4-18). If desired, some of the information contained in the road movement table may be determined by march calculations. The road movement table usually consists of two parts: a data paragraph reflecting general information, or information common to two or more serials; and a tabular list of the march serials, together with all other necessary information regarding them. Road movement tables will frequently require a wider distribution than a march or operation order so that copies can be issued to movement control personnel, military police traffic posts, and the like.

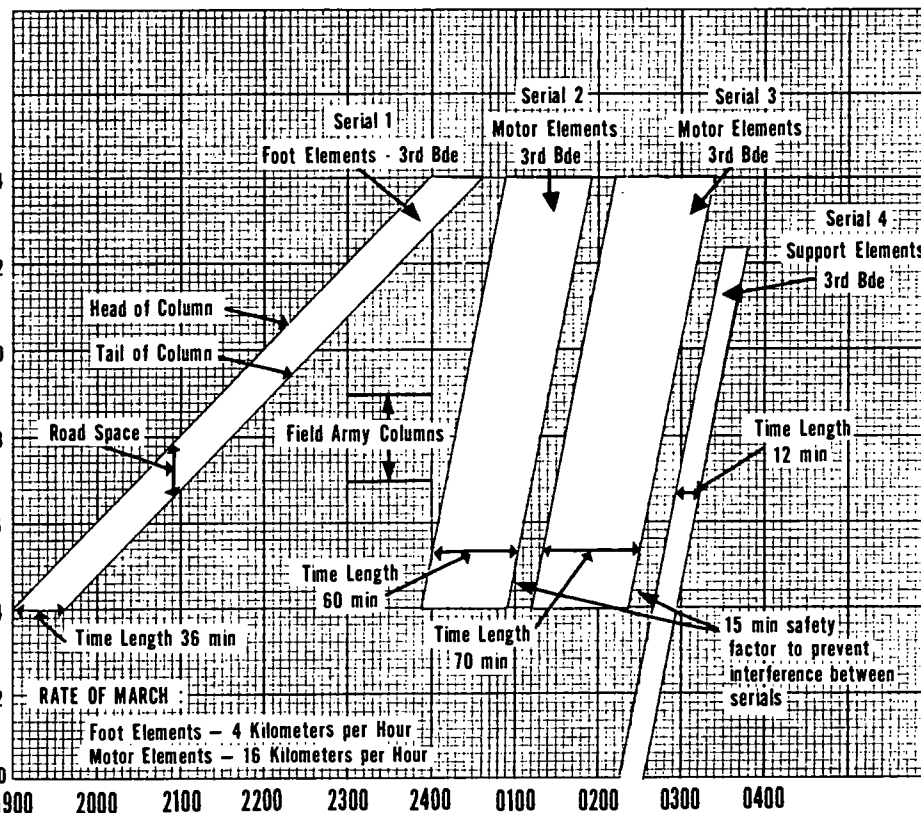
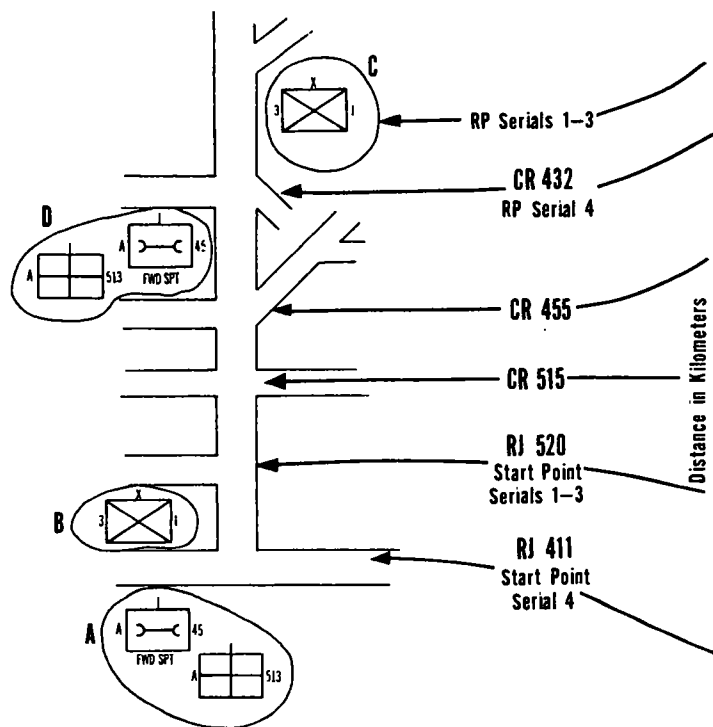


Figure 4-18

(2) Example of road movement table.

Annex----- (Road Movement Table) to OPORD-----

Reference: Map***.

1. Average or maximum speed.
2. Traffic density (type march column).
3. Halts.
4. Routes between start points (SP) and release points (RP).¹

(Classification)

5. Critical points.¹
 - (a) Start points.
 - (b) Release points.
 - (c) Other critical points.

Normal ORORD heading

6. Main routes to start points.¹
7. Main routes from release point.¹

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Serial	Date ¹	Organization and commander	No. of vehicles	Load class of heaviest vehicles	Present location ³	Route ¹	New location ³	Route to start point	TL (min)	Control of movement			Route from release point	Remarks
										Location of critical points ⁴	Arrival time	Clearance time		
1	(***)	2d Inf Div Col Johns, 1st Inf Bde Comdr	(***)	(***)	SAARBURG area	RED	METZ area	(***)	75	SP RJ (THIONVILLE) METZ RP DP	(***) (***) (***) (***)	(***) (***) (***) (***)	(***)	(***)
2	(***)	2d Inf Div Col Smith, DISCOM Comdr	(***)	(***)	SAARBURG area	RED	METZ area	(***)	45	SP RJ (THIONVILLE) METZ RP DP	(***) (***) (***) (***)	(***) (***) (***) (***)	(***)	(***)
3	(***)	2d Inf Div Col Dunn, 2d Inf Bde Comdr	(***)	(***)	SAARBURG area	BLUE	METZ area	(***)	95	SP BIBICHE Bridge RJ (BOUZONVILLE) RP DP	1730 1746 1810 1922 1954	1905 1921 1945 2057 2129	(***)	(***)
4	(***)	Div Trp Col Short, Div Arty Comdr	(***)	(***)	SAARBURG area	BLUE	METZ area	(***)	154	SP BIBICHE Bridge RJ (BOUZONVILLE) RP DP	1920 1936 2000 2112 2144	2150 2206 2220 2342 0014	(***)	(***)
5	(***)	2d Inf Div Col Pickett, 3rd Inf Bde Comdr	(***)	(***)	SAARBURG area	YELLOW	METZ area	(***)	75	SP RJ (SAARLAUTERN) RJ (ST AVOLD) RP DP	(***) (***) (***) (***)	(***) (***) (***) (***)	(***)	(***)

Acknowledge⁵
 Appendixes
 Distribution
 Authentication

Commander⁵

(Classification)

¹ Routes and points are described in the data paragraphs by grid references, code, words, etc., and, if necessary numbered or lettered for ease of reference in the columns below.

² Only the minimum number of columns of the table should be used.

³ Since the table may be issued to personnel concerned with control of traffic, the security aspect must be remembered. It may not be desirable to include dates or locations.

⁴ Critical point is defined as a selected point along a route used for reference in giving instructions. It includes start points, release points, and other points along a route where interference with movements may occur.

⁵ If the table is issued by itself, and not as an annex to a more detailed order, the table must be signed or authenticated in the normal way.

k. Strip Map.

- (1) *General.* A strip map is a schematic sketch of the routes of march that contain useful information concerning them. A strip map should be included as an annex to the march order issued by the division or brigade. It is particularly useful to small-unit commanders for organization control. Strip maps should be reproduced in quantity by using units and supplied to key personnel, particularly to vehicle commanders and route markers.

- (2) *Example of strip map* (fig. 4-19).

l. Vehicle Availability Table.

- (1) *General.* The vehicle availability table is used in planning the movement of an infantry division by means of its own organic transportation. It helps the transportation officer make a plan for drawing 2½-ton or 5-ton trucks from subordinate units of the division in accordance with their ability to furnish them. Across the top of the table are listed all the subordinate units of the division except the cavalry squadron. This unit is omitted because its vehicles are not normally

available. In column 1, the 2½-ton and 5-ton trucks of the division are divided into priorities of availability according to their normal uses. When the transportation officer levies on units for trucks, he will deplete each priority, starting with the highest, until he obtains the required number of vehicles. All the 2½-ton and 5-ton trucks of the division do not appear on the table. The prime movers, maintenance vehicles, command and fire control vehicles, and essential signal communication vehicles are omitted because it is not intended that these vehicles ever be used for general cargo hauling or for transporting troops or other units. For any given move, the number of vehicles actually available will vary because of dead-lined trucks, combat losses, and restrictions applicable to the move under consideration. Using the vehicle availability table and the troop strengths of the units requiring additional transportation, the number and source of vehicles required for the march can be quickly and accurately determined.

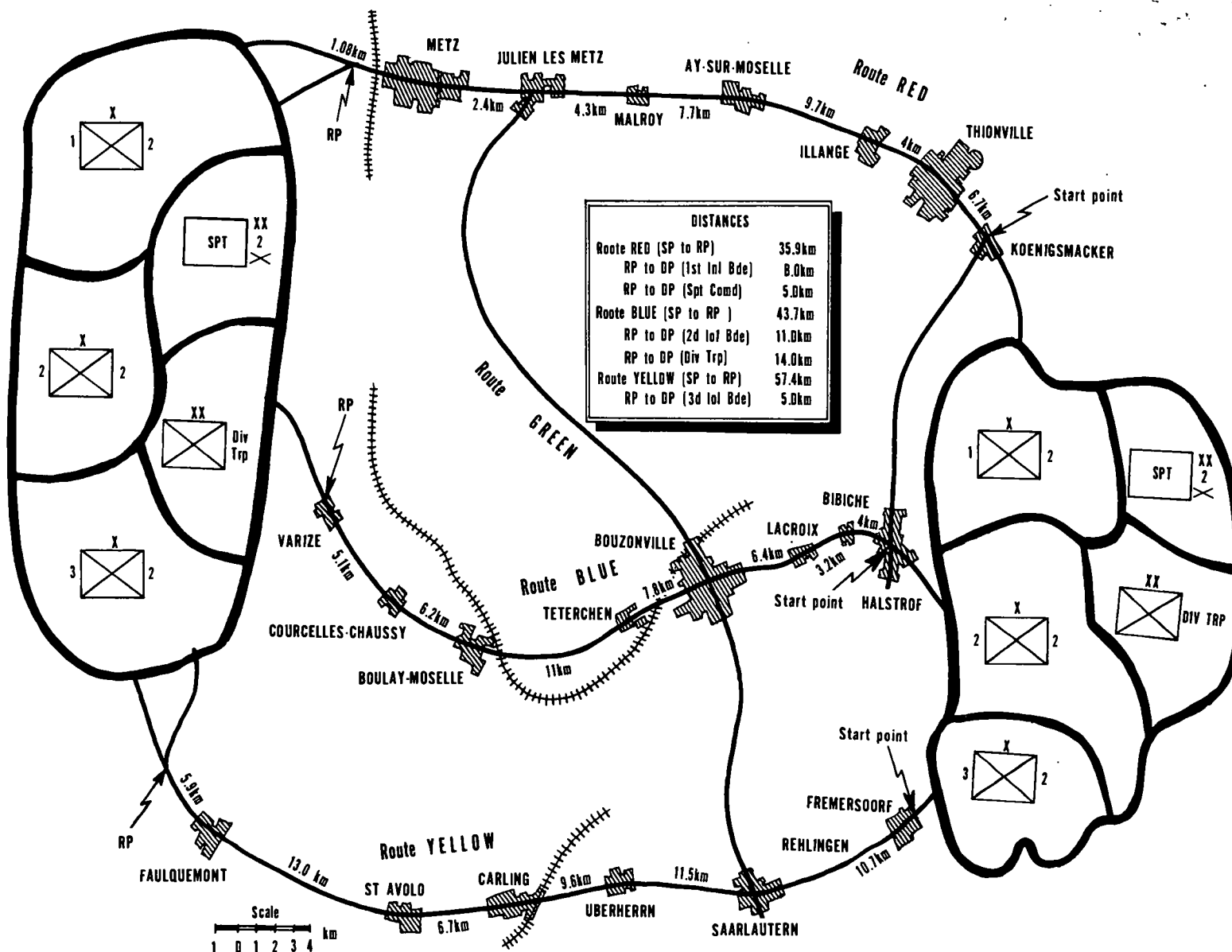


Figure 4-19

(2) Example of vehicle availability table.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Priority	Normal use	1st Inf Bde	2nd Inf Bde	3rd Inf Bde	HQ & HQ Btry, 20th Inf Div Arty	1st. How Bn (105-mm/155-mm) 45th Arty	2d How Bn (105-mm/155-mm) 45th Arty	3d How Bn (105-mm/155-mm) 45th Arty	4th How Bn (105-mm/155-mm) (SP), 45th Arty	5th How Bn (105-mm/155-mm) (SP), 45th Arty	1st Rkt How Bn (HJ/8-in), 46th Arty	20th Engr Bn	1st Med Tk Bn (Patton) 1st Armor	HQ Co, 20th Inf Div	20th Armd Cav Sqdn	20th Sig Bn ¹	20th MP Co	20th Inf SUPCOM	20th Avn Bn	Total div
		Max																		Max
		Aval																		Aval
1	Sup and gen cgo	3	3	3	3	3	3	3	3	3	4	5	15	0	0	0	0	6	0	57
2	Org eqp	0	0	0	7	9	9	9	9	9	8	10	7	1	7	6	0	9	10	110
3	Ki trk	7	7	7	1	3	3	3	3	3	6	6	6	1	1	1	1	3	1	60
4	Engr tool and brg	4	4	4	0	0	0	0	0	0	0	57	0	0	0	0	0	0	0	69
5	Ammo trk	11	11	11	0	10	10	10	10	10	0	0	9	0	0	0	0	0	0	92
6	Sig comm	0	0	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4
	Total	25	25	25	14	25	25	25	25	25	15	79	37	2	8	7	1	18	11	392

¹ Sig bn veh shown are those which do not have shifters or sig eqp installed thereon.

Maximum availability



Current availability

m. Vehicle Assignment Table.

- (1) *General.* The assignment table shows from which units the vehicles will be drawn and to which units they will be

assigned for the move. This table is based on the vehicle availability table (1(2) above).

- (2) *Example of vehicle assignment table.*

	1	2	3	4	5	6	7
		Number of 2½-ton or 5-ton trucks provided and unit to which furnished					
		1st Echelon			2d Echelon		
1	Unit from which transport is furnished	1st Bde	2d Bde	3d Bde	20th Sig Bn	*20th Admin Co	Elm Div Trp and Div Spt Comd
2	1st Bde -----			22			
3	2d Bde -----			20			
4	3d Bde -----	18					
5	1/1 Armor -----					5	
6	1/2 Armor -----				5		
7	1/45 Arty -----					6	
8	1/46 Arty -----					7	
9	20th Sup & Trans Bn -----	45					
10	20th Engr Bn -----		45				
11	20th Signal Bn -----		18				
12	Total -----	63	63	42	5	18	

* This transportation required only when moving simultaneously with division.

n. March Calculator.

- (1) *General.* A march calculator is a special form of a slide rule. The desired road space or time length of any unit can be read from the calculator provided that the number of vehicles in the unit column is known. The calculator readings include the road space or time interval between march units but not those between march serials of battalion, task force or brigade size. When using the calculator to determine the road space or time length of two or more brigades, add to the

readings a 15 minute time interval (or equivalent road space) for every interval between march serials of brigade size, plus a 5 minute time interval (or equivalent road space) for every interval between subordinate march serials of battalion or task force size. The time intervals between march units of company, battery or troop size are built-in in the readings of the calculator.

- (2) *Example of march calculator* (fig. 4-20).

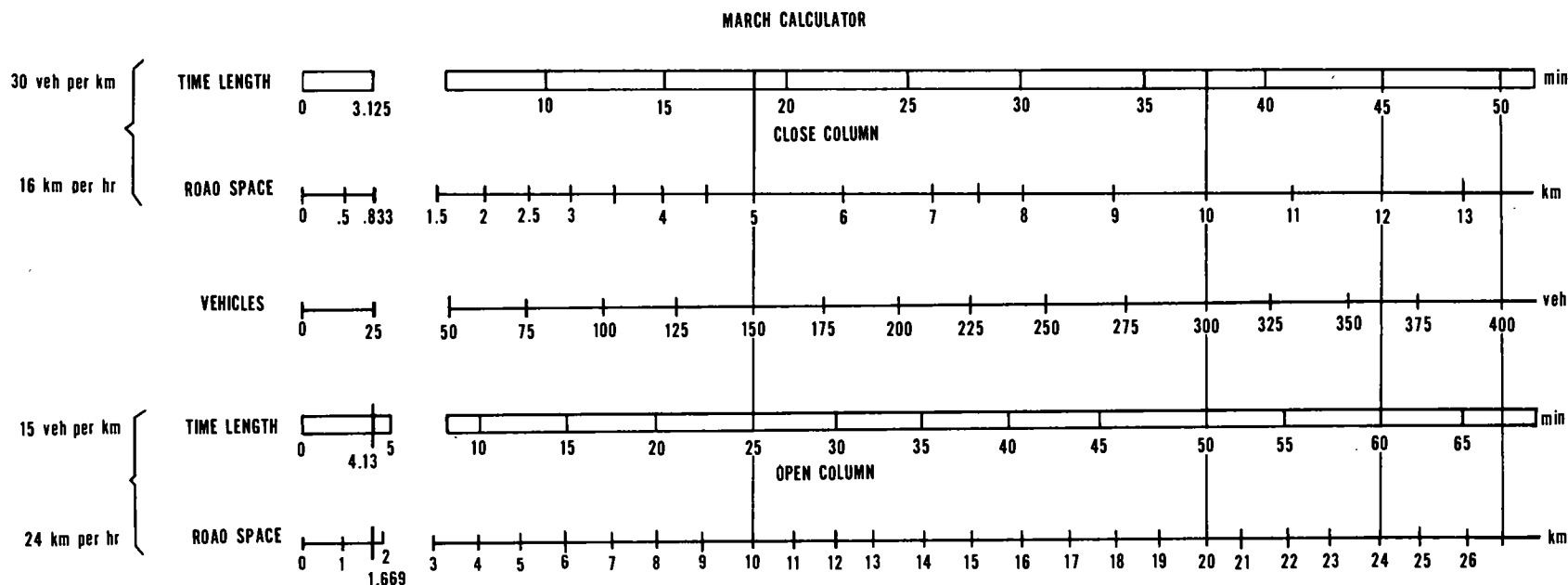


Figure 4-20

INSTRUCTIONS

1. The tables below show organic vehicles divided into quartering (advance) party and march column. To find total organic vehicles in a unit, add figures in these columns opposite the unit.
2. To find road space and time length of any unit, set edge of slide at number of vehicles in that unit, read desired road space and time length on the appropriate scale above or below.
3. For composite groupings, add vehicles and read as in 2 above.
4. Where vehicles in a column exceed 400, compute for $\frac{1}{2}$ total and double the answer.
5. Figures are based on latest tables of organization and equipment.
6. Readings will include the road space and time interval between march units but not between march serials of battalion, task force or brigade size.
7. When using the calculator to determine road space or time length of 2 or more brigade size units, add to readings a 15-minute time interval (or equivalent road space) for each interval between these march columns. When brigades are divided into subordinate battalion or task force size serials, add 5-minute time interval (or equivalent road space) for each interval between subordinate serials. The normal $2\frac{1}{2}$ -minute time intervals between company, battery of troop size march units are included in the readings shown in the scales of this calculator.

Figure 4-20—Continued
[Located in back of manual]

4-11. Motor Movement by Echelon

a. Definition. Motor movement by echelon is a movement in which a unit, such as an infantry division, lacking sufficient organic transportation to move all its personnel and equipment in one trip, uses a portion of its transportation to move its foot troops and essential supplies (by complete tactical units) in successive trips until the movement of all has been completed.

b. Sequence. The sequence of events can be briefly shown in terms of time consumed as follows:

- (1) Preparation time (first echelon).
- (2) Time distance (each route).
- (3) Time length (close entire first echelon).
- (4) Unload.
- (5) Reassembly.
- (6) Time distance (each route).
- (7) Time length (returning trucks).
- (8) Load.
- (9) Reassembly (head of column at start point).
- (10) Time distance (each route).
- (11) Time length (close entire second echelon).

c. Basic Principles. Although vehicles must be utilized to the maximum in a movement by echelon, there are certain basic principles to be observed if the combat efficiency of the division is to be maintained. These are as follows:

- (1) In levying on units for transportation, exclude weapons vehicles, prime movers, maintenance trucks, and essential command, reconnaissance, and signal communication vehicles. Units must retain their battlefield mobility and effectiveness.
- (2) Leave sufficient ammunition vehicles with units moved in the first echelon to enable them to conduct operations until supply can be instituted. It is preferable that these units have the use of all their ammunition vehicles. However, they are normally allowed to retain at least two-thirds of them.
- (3) Normally provide for the field trains to march with their parent organiza-

tions. Field trains consist of kitchen, baggage, and administrative vehicles and such fuel, medical, and maintenance vehicles that are not part of the combat trains. Upon arrival in the new area, field train vehicles in the first echelon, assigned for movement of the second echelon, dump their basic loads and return to assist in the movement of that echelon.

- (4) Avoid dumping the basic loads of a large number of vehicles in the forward area.
- (5) Employ as a group vehicles taken from a unit wherever possible in order to facilitate control and maintenance by the parent unit.
- (6) Employ vehicles from other elements of a unit to move the foot troops of that unit whenever possible. Similarly, vehicles from units usually associated in a normal combat grouping should be used to move the foot troops of that grouping.
- (7) Use only 2½-ton or 5-ton trucks, including dump trucks, unless otherwise prescribed, to move foot troops.

d. SOP. Since motor movement by echelon requires careful planning, it is advisable for a division to have several plans prepared in the form of an SOP. Time for planning such moves will nearly always be short. In such a situation, to modify an existing plan is much quicker than to prepare an entirely new one. SOP plans should contain—

- (1) A plan number.
- (2) A standard composition for the division security force.
- (3) A standard composition and duties of quartering (advance) party.
- (4) The units to move in each echelon.
- (5) Organization of columns.
- (6) The assignment of vehicles to move foot troops and impedimenta, showing the unit from which obtained and the unit to which assigned for the move.
- (7) Adequate provisions for signposting and traffic control.

e. Time Formula. When time precludes detailed planning, such as outlined above, the following formula may be useful in rapidly estimating the total time of such a movement:

$$\text{Hours required} = \frac{\text{Number of trips} \times \text{distance in kilometers}}{\text{Rate of march in km in the hour}} + T$$

- (1) The "number of trips" is the number of trips in either direction; *for example*, in a two-echelon movement, three trips would be required—one forward trip to move foot troops, a return trip, and a second trip forward for the remainder of troops and organic loads.
- (2) T (a variable) represents the number of hours consumed in unloading and loading personnel and equipment, in turnarounds at forward and rear assembly areas, and in closing the column into its area of destination. When two routes are available and the movement is made in close column in two echelons, a value of six may be assumed for T, as giving a reasonable factor of safety. When more than two routes are available, the value of T may be reduced.
- (3) "Rate of march in km in the hour" represents the average speed of the vehicles in the movement over a period of time, including short halts.

4-12. Movement by Air Force Aircraft

a. General.

- (1) The tables in this paragraph may be used as a general guide to determine the aircraft requirements, by type of transport aircraft, for air movement of nondivisional units that might be found in a type field army (para 4-2). For aircraft requirements for air movement of the airborne or infantry division and organic units thereof, see FM 57-10, FM 57-35 and TM 57-210, respectively. For data to compute aircraft requirements to transport Army

aircraft in Air Force transport aircraft, see paragraph 7-44e. The following tables are based on data compiled for a theoretical situation which assumes full TOE strength and complete TOE equipment. In applying these tables to actual air movement, bear in mind that the required lift for any unit will fluctuate with the personnel and equipment status of that unit and with the allowable cargo load of the aircraft for the specific operational conditions of the air movement. The tables show numbers of aircraft loads; i.e., the number of sorties, by type of aircraft, required to move a particular unit. Fewer aircraft than shown may be used to transport the unit if part or all of the aircraft fly more than one sortie.

- (2) The air movement of a large body of troops normally will involve departures from several airfields and, in airlanded operations, concurrent landing at several terminal airfields, airlanding facilities, or landing zones in the objective area. The availability of transport aircraft, air installations and base facilities; the urgency of the situation; and enemy capabilities will be major factors which will determine the number of installations employed as well as the number of sorties to be flown by the transporting aircraft. For general considerations and procedures governing the employment of air transportation, see FM 100-5 and FM 101-5. For specific information regarding load planning, determination of aircraft requirements, and forms relative to air movement, see TM 57-210.

b. Aircraft Requirements—Field Army.

- (1) *General.* The tabulated data in (4) below represent aircraft requirements for selected units of a type field army. These data are provided as a guide only in planning for airborne operations or the administrative air movement of units of a type field army.

- (2) *Equipment and supplies.* Column 3 of these tables indicates the total weight of each unit in short tons. This figure is the sum of the weights of TOE personnel, TOE equipment, and required supplies.

(a) *TOE personnel and equipment.* Unless otherwise indicated, all units are moved at 100 percent personnel and equipment TOE strength. An average weight of 260 pounds per individual is used in determining total personnel weight for a unit. Weights of vehicles are determined by use of net weights as given in applicable technical manuals.

(b) *Supplies.* The major classes of supply considered are classes I, III, IIIA, and V. The accompanying class II and IV supplies will be limited to critical items based on a 15 day requirement.

1. Class I supply is based on 5 days to accompany each unit, with an average of 6.6 pounds per man per day.

2. Class III and Class IIIA supply are based on the weight of gasoline, oil, and lubricants required to operate ground and air vehicles a minimum of 5 days. Class III requirements for other equipment is established on a reasonable hourly operational basis for 5 days.

3. Class V supply weights are based on the basic load for all units adjusted to a reasonable rate of expenditure to reflect 5 days of Class V supply.

(3) *Aircraft requirements.*

(a) Aircraft requirements listed in (4) below reflect the number of sorties required to transport the various units.

(b) Aircraft requirements are based on the following assumed allowable cargo loads (2,000 nautical mile range):

C-130 medium transport	
airplane -----	30,000
C-124 heavy transport	
airplane -----	35,000
C-141 heavy transport	
airplane -----	70,000

(c) In determining aircraft requirements, the "type load method" (as opposed to the "weight method" (TM 57-210)) has been utilized. Units have been loaded administratively rather than tactically.

(d) Air Force troop carrier units providing aircraft for the specific operation being considered will announce to the Army component of the airborne force the allowable cargo load for each type of aircraft to be employed; the allowable cargo load will vary with the distance to be flown and other operational conditions.

(e) In any airborne operation, it may be necessary to use types of aircraft other than those listed. However, the data given will serve as a basis for adaptation of the units to be moved to the types of aircraft that are available.

(f) Three types of combinations of aircraft are indicated in column 4.

1. Combination 1 consists of C-130's and C-124's. In determining aircraft requirements for this combination, the minimum required number of C-124's has been utilized; i.e., items of equipment which cannot be carried in C-130's have been loaded in C-124's; after filling type loads for the C-124's, the remainder of the unit's personnel, equipment, and supplies have been loaded into C-130's.

2. Combination 2 consists of C-141's and C-124's. In determining aircraft requirements for this combination all equipment that can be carried in C-124's has been loaded

in them; after filling type loads for the C-124's, the remainder of the unit's personnel, equipment, and supplies have been loaded into C-141's.

3. Combination 3 is for C-141's only. In determining aircraft requirements for this combination, all personnel, equipment, and supplies have been loaded into C-141's.

4. Units noted as "not transportable in medium transport aircraft" have such quantities of heavy or bulky equipment that efficient loading utilizing combination 1 is precluded.

5. Units noted as "not air-transportable" are those whose primary mission depends on items of equipment which cannot be loaded into C-124's or C-141's.

(g) In selecting aircraft or combinations of aircraft by which to transport a unit, careful consideration must be given to the primary mission of the unit and the requirement

for the unit in the objective areas. During the initial stages of an airborne assault, units transported to the objective area will utilize a combination of parachute and assault aircraft. Subsequent to the initial assault and after landing facilities have been prepared, medium transport aircraft may be used in the air-landed role. When facilities are developed sufficiently to handle heavy transport aircraft, units requiring this means of transportation can be brought into the objective area.

(h) For supplemental classified data on airlift requirements for field artillery units with nuclear capabilities, air defense units, and nuclear weapon and missile support units, see FM 101-10-3, chapter 4, section III.

(4) *Tabulated requirements—a type field army.*

(a) *Divisions.*

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
2	Armd div -----	17E	-----	-----	-----	-----	-----	(1) See FM 7-100 (1) See FM 57-100
3	Inf div -----	7E	-----	-----	-----	-----	-----	
4	Inf div (mech) -----	37E	-----	-----	-----	-----	-----	
5	Abn div -----	57E	-----	-----	-----	-----	-----	

¹ Not air-transportable. (See (3) (f) 5, above.)

(b) *Nondivisional units.*

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
2	Armor.....							Armor units of the field army not air-transportable.
3	Army aviation: HQ & HQ det, avn gp.....	1-102P	(1)	1	5			(2)
				2		4		
				3			3	
4	Army avn co.....	1-137D	217.1	1	15			(2)
				2		13		
				3			6	
5	Corps avn co.....	1-127D	219.2	1	14			(2)
				2		13		
				3			6	
6	Corps arty avn co.....	1-117D	(1)	1	11	3		(2)
				2		15	2	
				3			9	
7	Avn fxd-wing lt.....	1-107T	183.7	1	12	1		(2)
				2		10	1	
				3			5	
8	Army avn op det.....	1-207D	81.2	1	5	1		
				2		4	1	
				3			3	
8-1	Aerial surv 1 co.....	1-128E						
9	Air defense artillery: HQ & HQ btry, ADA bde.....	44-2E	511	1	34			MSG-4 not trans- portable.
				2		29		
				3			15	
10	HQ & HQ btry, ADA gp.....	44-12E	493	1	33			MSG-4 not trans- portable.
				2		28		
				3			13	
11	ADA AW bn sp.....	44-85E	1,780	1	40	69		Tank recovery vehicle not trans- portable.
				2			102	
				3			51	
12	ADA msl bn, NIKE-HERCULES ³	44-535D	2,794	1		159		
				2			80	
				3				
13	ADA msl bn, HAWK ³	44-235D	1,718	1				Wrecker 2½T & 5T & Scoop Loader not transportable.
				2		138		
				3			69	
14	Field artillery: HQ & HQ btry, corps arty.....	6-501E	329.86	1	22			
				2		19		
				3			10	
15	HQ & HQ btry, FA gp.....	6-401E	265.40	1	18			
				2		17		
				3			8	
16	FA bn, 105-mm, towed.....	6-405E	1,177.62	1	78	1		
				2		68		
				3			34	

See footnotes at end of table.

1	1	2	3	4	5	6	7	8
	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
17	FA bn, 105-mm, SP.....	6-465E	1,635.48	³ 1				
				2		57	19	
				3			47	
18	FA bn, 155-mm, towed.....	6-425E	1,441.59	1	96	1		
				2		83		
				3			41	
19	FA bn, 155-mm, SP.....	6-455E	1,783.67	³ 1				
				2		64	19	
				3			51	
20	FA bn, 8-inch, towed.....	6-415E	1,658.43	1	84	23		
				2		95		
				3			47	
21	FA bn, 8-inch, SP.....	6-445E	2,522.61	³ 1				
				2		118	13	
				3			72	
22	FA bn, 175-mm, SP.....	6-435D	1,778.29	³ 1				
				2		77	13	
				3			51	
23	FA bn, 280-mm.....	6-535D	1,499.87	³ 1				
				⁴ 2				
				⁴ 3				
24	FA bn, LITTLE JOHN.....	6-565T	⁶ 600.15	1	41			
				2		35		
				3			17	
25	FA bn, HONEST JOHN.....	6-525E	⁶ 699.35	1	36	7		
				2		40		
				3			20	
26	FA bn, LACROSSE.....	6-585T	⁶ 478.87	1	31	1		
				2		28		
				3			14	
27	FA bn, CORPORAL.....	6-545E	⁶ 997.08	³ 1				
				2		43	7	
				3			29	
28	FA bn, REDSTONE.....	6-635E	⁶ 2,748.55	³ 1				
				⁴ 2				
				⁴ 3				
29	FA bn, SERGEANT.....	6-555T	⁶ 951.78	1	56	7		
				2		55		
				3			27	
30	FA bn, PERSHING.....	6-615T	⁶ 2,238.48	³ 1				
				2		126	1	
				3			64	
31	FA tgt acqn bn.....	6-575E	1,377.09	1	91	1		
				2		79		
				3			39	
32	FA slt btry.....	6-558E	192.80	1	13			
				2		12		
				3			6	
33	<i>Chemical:</i> HQ & HQ det, cml gp.....	3-32E	34.0	1	3			
				2		2		
				3			1	

See footnotes at end of table.

1	1	2	3	4	5	6	7	8
	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
34	HQ & HQ det, cml bn, svc-----	3-36E	21.8	1 2 3	2	2		
35	Cml direct spt co-----	3-7E	458.1	1 2 3	22	8 26	13	
36	Cml gen spt co-----	3-147E	264.5	1 2 3	10	6 15	8	
37	Cml maint co-----	3-47E	109.8	1 2 3	5	2 6	3	
38	Cml depot co-----	3-67D	130.0	1 2 3	7	1 7	4	
39	Cml decon co-----	3-217E	186.1	1 2 3	5	6 11	6	
40	HQ & HQ det, cml smoke genr bn----	3-266E	24.2	1 2 3	2	2		
41	Cml smoke genr co-----	3-267E	270.0	1 2 3	18	15	8	
42	Cml tech intel det (GA)-----	3-500E	15.8	1 2 3	2	1		
43	Cml mobile lab det (HA)-----	3-500E	19.1	1 2 3	2	2		
44	Cml munitions safety control det (IA).	3-500E	20.1	1 2 3	2	2		
45	Cml CBR center det (JA)-----	3-500E	4.7	1 2 3	1	1		
46	<i>Engineer:</i> HQ & HQ co, engr bde-----	5-301R	100.3	1 2 3	7	6	3	
47	HQ & HQ co, engr cmbt gp-----	5-192C	119.8	1 2 3	8	7	4	(2)
48	HQ & HQ co, abn engr cmbt gp----	5-192C	(1)	1 2 3	10	9	5	(2)
49	HQ & HQ co, engr cmbt bn, army----	5-36D	322.5	1 2 3	16	9 18	9	
50	Engr cmbt co, army-----	5-37D	245.3	1 2 3	17	4 14	7	

See footnotes at end of table.

	1	2	3	4	5	6	7	8	
1	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks	
					C-130	C-124	C-141		
51	HQ & HQ co, engr const gp-----	5-312R	66.0	1 2 3	5			Crushing and screening plant must be disassembled.	
52	HQ, H&S co, engr const bn-----	5-316R	844.8	1 2 3	56		2		
53	Engr const co-----	5-317R	317.0	1 2 3	8	12	24		
54	HQ & HQ co, engr maint & sup gp--	5-262R	77.0	1 2 3	5		9		
55	HQ & HQ det, engr cam bn-----	5-96D	33.5	1 2 3	3	2	1		
56	Engr cam co-----	5-97D	59.8	1 2 3	4	3	2		
57	HQ & HQ co, engr topo bn, army...	5-56D	156.0	1 2 3	10	9	5		
58	Engr map repro and distr co, army..	5-57D	196.8	1 2 3	9	5	6		
59	Engr photomapping co, army-----	5-59D	108.5	1 2 3	4	3	3		
60	Engr topo co, corps-----	5-167C	226.0	1 2 3	10	5	8		
61	HQ & HQ det, engr dep bn-----	5-266D	39.5	1 2 3	3	2	1		
62	Engr dep co-----	5-267D	345.5	1 2 3	3	16	10		
63	Engr dump trk co-----	5-124D	598.8	1 2 3	18	17	17		
64	Engr fld maint co-----	5-157C	380.8	1 2 3	13	12	11		
65	Engr float brg co-----	5-78E	(1)	1 2 3	42	67	51		
66	Engr hv eqp co-----	5-328R	1,192.0	1 2 3	15	52	34		15-ton truck-tractor and 40-ton crane not air-transportable. Crushing and screening plant must be disassembled.

See footnotes at end of table.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
07	Engr LE co.....	5-54D	(1)	1	17	69		Organic to FA msl gp, REDSTONE, TOE 6-630T.
				2		89		
				3			45	
08	Engr LE co, abn.....	5-54D	(1)	1	29	42		
				2		59		
				3			30	
69	Engr PNLBRG co.....	5-137D	568.8	1	43	5		
				2		32		
				3			30	
70	Engr parts dep co.....	5-279D	250.3	1	10	6		
				2		14		
				3			7	
71	Engr SUPPT co.....	5-48D	200.5	1	4	9		
				2		11		
				3			6	
72	Engr WS co.....	5-67D	302.5	1	4	9		
				2		17		
				3			9	
73	Engr base map depco.....	5-344R	76.8	1	5			
				2		4		
				3			2	
74	Engr co, REDSTONE.....	5-214D	1,273.5	1	9	61		
				2		72		
				3			36	
75	Engr co svc HQ team (AC).....	5-500C	(1)	1	1			
				2		1		
				3				
76	Engr sp eqp maint team (EC).....	5-500C	21.5	1	1	1		
				2		2		
				3				
77	Engr fld maint team (NIKE-smb) (EF).	5-500C	47.8	1	1	2		
				2		3		
				3			2	
78	Engr fld maint team GM/CORPORAL (EG).	5-500C	36.5	1	2	1		
				2		2		
				3			1	
79	Engr fftg teams (FA, FB, FD, and FE).	5-500C	9.3	1	1			
				2		1		
				3				
80	Engr until team (HG).....	5-500C	125.8	1	5	3		
				2		7		
				3			4	
81	Engr tech intel coll team (IG).....	5-500C	5.3	1	1			
				2		1		
				3				
82	Engr tech intel rsch team (IH).....	5-500C	12.3	1	1			
				2		1		
				3				
83	Engr terrain team (IK).....	5-500C	11.3	1	1			
				2		1		
				3				

See footnotes at end of table.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
84	<i>Infantry:</i> HQ & HQ co, sep inf bde.....	7-102E	531.5	1 2 3	20	14 30	15	(3)
85	Sep inf bde.....	7-100E	(1)	1 2 3	71	10 52	26	Tanks, combat, full-tracked, light-gun, not air-transportable.
86	Armd inf bn, sep.....	7-25D	2,208.0	1 2 3	30	100 126	63	Equipped with M59 personnel carrier and M84 heavy mortar carrier, self-propelled. Tank recovery vehicle, medium, not air-transportable.
87	HQ & HQ co, armd inf bn, sep.....	7-26D	708.0	1 2 3	11	36 40	20	
88	Rifle co, armd inf bn, sep.....	7-27D	375.0	1 2 3	3	17 22	11	
89	Armd inf bn, sep.....	7-25D	1,560.0	⁵ 1 2 3		90 90	45	Equipped with M113 personnel carrier and T257 heavy mortar carrier, self-propelled. Tank recovery vehicle, medium, not air-transportable.
90	HQ & HQ co, armd inf bn, sep.....	7-26D	600.0	⁵ 1 2 3		34 34	17	
91	Rifle co, armd inf bn, sep.....	7-27D	240.0	⁵ 1 2 3		14 14	7	
92	<i>Medical:</i> HQ & HQ det, med gp.....	8-122D	33.8	1 2 3	3	2	1	
93	HQ & HQ det, med bn.....	8-126D	36.9	1 2 3	3	2	1	
94	Med coll co.....	8-129D	61.2	1 2 3	4	4	2	
95	Med clr co.....	8-128D	189.5	1 2 3	13	11	6	

See footnotes at end of table.

1	1	2	3	4	5	6	7	8
	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
96	Med holding co.....	8-57D	80.9	1 2 3	6	5	3	(2)
97	PVNTMED co.....	8-204D	91.9	1 2 3	6	5	3	
98	Med amb co.....	8-127D	164.8	1 2 3	11	10	5	
99	Med air amb co.....	8-137D	163.0	1 2 3	10	10	5	
100	Mbl army surg hosp, 60-bed.....	8-571D	156.7	1 2 3	11	9	5	
101	Evac hosp, smbl.....	8-581D	293.1	1 2 3	13	11	6	
102	Fld hosp.....	8-510D	(1)	1 2 3	12	9	6	
103	Conv cen, army.....	8-590D	254.8	1 2 3	17	15	8	
104	Army med dep.....	8-667R	249.8	1 2 3	17	14	7	
105	HQ, vet svc (AF).....	8-500C	(1)	1 2 3	1	1		
106	HQ, professional svc unit (AG).....	8-500C	6.6	1 2 3	1	1		
107	Med sup det (FC).....	8-500C	(1)	1 2 3	2	2	1	
108	Opt det (GA).....	8-500C	(1)	1 2 3	1	1		
109	Opt det (GB).....	8-500C	(1)	1 2 3	1	1		
110	Med eqp maint det (GC).....	8-500C	(1)	1 2 3	1	1		
111	Vet food insp det (JA).....	8-500C	3.7	1 2 3	1	1		
112	Vet food insp svc det (JB).....	8-500C	31.9	1 2 3	3	2	1	

See footnotes at end of table.

1	1	2	3	4	5	6	7	8
	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
113	Surg det (KA).....	8-500C	4.6	1 2 3	1		1	Only 1 of 4 identical det depicted.
114	Ortho det (KB).....	8-500C	4.5	1 2 3	1		1	
115	Shock det (KC).....	8-500C	5.2	1 2 3	1		1	
116	Maxillo-facial det (KD).....	8-500C	4.6	1 2 3	1		1	
117	Neurosurgical det (KE).....	8-500C	4.6	1 2 3	1		1	
118	Thoracic det (KF).....	8-500C	4.6	1 2 3	1		1	
119	Gas det (KG).....	8-500C	38.4	1 2 3	3		2	
120	Den svc det (KJ).....	8-500C	33.9	1 2 3	4		2	
121	Den prosthetic det (KK).....	8-500C	8.4	1 2 3	1		1	
122	Psychiatric det (KO).....	8-500C	19.6	1 2 3	2		1	
123	Gen disp (MA).....	8-500C	16.1	1 2 3	2		1	
124	Med det (OA).....	8-500C	11.1	1 2 3	2		1	
125	Med intel det (QA).....	8-500C	2.4	1 2 3	1		1	
126	Military intelligence: HQ & HQ co, air recon spt bn.....	30-6D	(1)	1 2 3	13	6 7	4 9	
127	MI det, air recon spt bn.....	30-7D	(1)	1 2 3	3	3 3	2 3	
128	MI bn, fld army (-3 corps and 12 div det).	30-25E	(1)	1 2 3	61	23 54	4 39	

See footnotes at end of table.

1	1	2	3	4	5	6	7	8
	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
129	MI det, corps or abn corps.....	30-18E	(1)	1 2 3	7	4 8	5	
130	MI det, div (w/aug).....	30-17E	(1)	1 2 3	5	4 7	4	
131	MI det, a/c regt.....	30-14E	(1)	1 2 3	2	1 3	2	
<i>Military police:</i>								
132	HQ & HQ det, MP gp (AE).....	19-500D	20.7	1 2 3	2	2		
133	HQ & HQ det, MP bn, army.....	19-36E	62.6	1 2 3	5	4	2	
134	MP co, corps, abn corps, or army...	19-37E	110.9	1 2 3	8	6	3	
135	MP co, corps, abn corps, or army (aug).	19-37E	112.8	1 2 3	8	7	4	
136	HQ & HQ det, MP bn (AD, MG)...	19-500D	31.3	1 2 3	2	2	1	
137	MP ESCRG co.....	19-47E	75.6	1 2 3	5	4	3	
138	MP grd co.....	19-247D	31.0	1 2 3	2	2	1	
139	MP det, stockade (MG).....	19-500D	23.0	1 2 3	2	2		
140	MP det, crime inves (LF).....	19-500D	11.4	1 2 3	1	1		
141	MP det, crime inves (LF).....	19-500D	24.6	1 2 3	2	2	1	
<i>Ordnance:</i>								
142	HQ & HQ co, ord maint and sup gp...	9-12E	66.0	1 2 3	5	4	2	
143	HQ & HQ co, ord ammo gp.....	9-22E	265.0	1 2 3	18	15	8	
144	HQ & HQ det, ord maint and sup bn...	9-76D	42.0	1 2 3	3	3	2	

See footnotes at end of table.

1	1	2	3	4	5	6	7	8
	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
145	HQ & HQ det, ord ammo bn.....	9-86E	68.0	1 2 3	5	4	2	
146	Ord ammo co.....	9-17D	507.0	1 2 3	25	9 29	15	
147	Ord dir autmv spt co.....	9-127D	448.0	1 2 3	23	7 26	13	
148	Ord DS co.....	9-7D	407.0	1 2 3	19	8 24	12	Semitrailer, tank transporter, 50-ton, not air-transportable (10-ton truck-tractor prime mover not loaded).
149	Ord fld sup co.....	9-57D	629.0	1 2 3	34	8 36	18	
150	Ord sp ammo sup co.....	9-47D	1,204.0	1 2 3	72	12 74	37	
151	Ord sp ammo GS co.....	9-87D	735.0	1 2 3	42	7 42	21	
152	Ord GS co.....	9-9D	723.0	1 2 3	36	12 41	21	Semitrailer, tank transporter, 50-ton, not air-transportable (10-ton truck-tractor prime mover not loaded).
153	Ord gen autmv spt co.....	9-197D	630.0	1 2 3	32	11 36	18	
154	Ord park co.....	9-137E	266.0	1 2 3	15	3 15	8	Tank recovery vehicle, medium, not air-transportable.
155	Ord coll and clas co.....	9-167D	459.0	1 2 3	25	5 26	13	Tank recovery vehicle, medium, not air-transportable. Semi-trailer, tank transporter, 50-ton, not air-transportable (10-ton truck-tractor prime mover not loaded).

See footnotes at end of table.

1	1	2	3	4	5	6	7	8
	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
156	Ord tire rep co.....	9-117T	(1)	1	20	6		
				2		28		
				3			14	
157	Ord GM GS co.....	9-227D	(1)	1	26	6		
				2		36		
				3			18	
158	Ord det, EOD (KA).....	9-500D	21.0	1	2			
				2		2		
				3				
159	Ord det, EOD, aug (KB).....	9-500D	19.0	1	2			
				2		2		
				3				
160	Ord det, EOD, con (KC).....	9-500D	19.0	1	2			
				2		2		
				3				
161	Ord det, ballistic and tech svc (LA).....	9-500D	25.0	1	2			
				2		2		
				3			1	
162	Ord det, tech intel (LB).....	9-500D	4.0	1	1			
				2		1		
				3				
163	Ord det, tech intel, con (LC).....	9-500D	9.0	1	1			
				2		1		
				3				
164	Ord team, NIKE GS (GA).....	9-500D	167.0	1	10	1		
				2		9		
				3			5	
165	Ord det, GM DS (NIKE-AJAX/ HERCULES) (FA).	9-500D	228.0	1	12	3		
				2		13		
				3			7	
166	Ord det, GM, DS (HAWK) (FE)....	9-510D	(1)	1	6	4		
				2		9		
				3			5	
167	Ord det, GM, GS (HAWK) (FG)....	9-510D	(1)	1				
				2		6		
				3			3	
	<i>Quartermaster:</i>							
168	HQ & HQ det, QM gp.....	10-22E	36.6	1	3			
				2		2		
				3			1	
169	HQ & HQ det, QM DS bn.....	10-106D	37.3	1	3			
				2		2		
				3			1	
170	QM DS co (aug).....	10-107D	589.5	1	31	8		
				2		33		
				3			17	
171	HQ & HQ det, QM GS bn.....	10-446D	41.5	1	3			
				2		3		
				3			2	
172	QM fld dep co.....	10-447D	744.5	1	17	32		
				2		43		
				3			22	

See footnotes at end of table.

1	2	3	4	5	6	7	8
	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements		
					C-120	C-124	C-141
173	QM fld maint and svc co.....	10-448D	186.4	1 2 3	9 ----- -----	3 11 -----	----- ----- 6
174	QM svc co.....	10-449D	82.8	1 2 3	6 ----- -----	----- 5 -----	----- ----- 3
175	HQ & HQ det, QM bn.....	10-536D	35.2	1 2 3	3 ----- -----	----- 2 -----	----- ----- 1
176	QM petrl sup co, mbl.....	10-77D	589.0	1 2 3	22 ----- -----	17 33 -----	----- ----- 17
177	QM sales co.....	10-157D	264.8	1 2 3	14 ----- -----	3 15 -----	----- ----- 8
178	QM petrl dep co.....	10-377D	619.1	1 2 3	23 ----- -----	18 35 -----	----- ----- 18
179	QM aerial sup co.....	10-407D	287.9	1 2 3	72 ----- -----	2 17 -----	----- ----- 9
180	QM petrl prob lab det (mb1) (KC)	10-500R	30.3	1 2 3	1 ----- -----	1 2 -----	----- ----- 1
181	<i>Signal:</i> HQ & HQ det, sig gp.....	11-22D	44.2	1 2 3	3 ----- -----	----- 3 -----	----- ----- 2
182	HQ & HQ det, cmbt area sig gp, army.	11-32D	86.5	1 2 3	2 ----- -----	4 5 -----	----- ----- 3
183	HQ & HQ co, army sig bn.....	11-96D	(1)	1 2 3	12 ----- -----	4 14 -----	----- ----- 7
184	Sig comd op co, army sig bn.....	11-97D	(1)	1 2 3	46 ----- -----	42 75 -----	----- ----- 38
185	Sig fld op co, army sig bn.....	11-98D	(1)	1 2 3	108 ----- -----	26 115 -----	----- ----- 58
186	Sig spt op co, army sig bn.....	11-99D	(1)	1 2 3	40 ----- -----	30 60 -----	----- ----- 30
187	HQ & HQ co, cmbt area sig bn, army.	11-86D	248.6	1 2 3	7 ----- -----	9 14 -----	----- ----- 7
188	Cmbt area sig co.....	11-87D	493.9	1 2 3	10 ----- -----	22 28 -----	----- ----- 14

Truck, forklift,
15,000-lb capacity,
not air-trans-
portable.

See footnotes at end of table.

1	1	2	3	4	5	6	7	8
	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
189	HQ & HQ det, sig cable const bn...	11-46D	123.2	1	4	4		
				2		7		
				3			4	
190	Sig cable const co.....	11-47D	564.8	1	16	21		
				2		32		
				3			16	
191	HQ & HQ det, army sig sup and maint bn.	11-156D	104.0	1	2	5		
				2		6		
				3			3	
192	Sig fwd sup and maint co.....	11-157D	388.2	1	12	14		
				2		22		
				3			11	
193	Sig dep co.....	11-158D	313.6	1	8	12		
				2		18		
				3			9	
194	HQ & HQ co, corps sig bn or sig bn, abn corps.	11-16D	190.3	1	3	10		
				2		11		
				3			6	
195	Comd op co, corps sig bn or sig bn, abn corps.	11-17D	040.2	1	17	26		
				2		37		
				3			19	
196	Fld op co, corps sig bn or sig bn, abn corps.	11-18D	973.1	1	23	42		
				2		56		
				3			28	
197	HQ & HQ det, cmbt EW sig bn, corps.	11-66D	76.1	1	1	4		
				2		4		
				3			2	
198	Cmbt EW sig co, inf.....	11-67D	340.5	1	12	9		
				2		19		
				3			10	
199	Cmbt EW sig co, armd.....	11-68D	438.2	1	5	20		
				2		22		
				3			11	
200	HQ & HQ det, AD EW sig bn, army.	11-166D	118.9	1	4	4		
				2		7		
				3			4	
201	AD EW sig co, army.....	11-167D	215.8	1	8	5		
				2		13		
				3			6	
202	Sig comm cen op co.....	11-137D	422.2	1	14	14		
				2		24		
				3			12	
203	Sig det, auto data proc sys (med) (TF).	11-500D		1				
				2				
				3				
204	Sig det, auto data proc sys (small) (TG).	11-500D		1				
				2				
				3				
205	Sig det, crypto spt (NA).....	11-500D	(1)	1	1			
				2				
				3				

See footnotes at end of table.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
206	Sig det, crypto spt (NB)-----	11-500D	(1)	3 1				
				2		2		
				3			1	
207	Sig det, intel coll (TA)-----	11-500D	(1)	1	1			
				2		1		
				3				
208	Sig det, intel off sec (TB)-----	11-500D	(1)	1	1			
				2		1		
				3				
209	Sig det, intel off sec (TC)-----	11-500D	(1)	1	1			
				2		1		
				3				
210	Sig det, eqp eval (TD)-----	11-500D	(1)	1	1			
				2		1		
				3				
211	Sig det, radar maint unit, type E (RQ).	11-500D	(1)	3 1		1		
				2		1		
				3				
212	Sig det, AD sys maint (ADA gp) (RS).	11-500D	(1)	1	3	1		
				2		2		
				3			1	
213	Sig det, AD sys maint (ADA bn) (RT).	11-500D	(1)	1	1	1		
				2		2		
				3			1	
Transportation:								
214	HQ & HQ det, trans Army acft maint and sup bn (DS, GS, and transport spt).	55-456D		1				
				2				
				3				
215	Trans acft direct spt co, DS-----	55-457D		1				
				2				
				3				
216	Trans acft general spt co, GS-----	55-458D	167.8	1	9	2		
				2		10		
				3			5	
217	Trans transport acft direct spt co, DS.	55-468D		1				
				2				
				3				
218	Trans lt transport helicopter direct spt maint and sup co, DS.	55-469D		1				
				2				
				3				
219	HQ & HQ det, trans trk gp-----	55-12D	49.9	1	4			
				2		3		
				3			2	
220	HQ & HQ det, trans trk bn-----	55-16E	50.2	1	4			
				2		3		
				3			2	
221	Trans lt trk co (2½-ton)-----	55-17E	526.7	1	34	1		
				2		30		
				3			15	

See footnotes at end of table.

1	1	2	3	4	5	6	7	8
	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
222	Trans lt trk co (5-ton)-----	55-17E	719.7	3 1 2 3		41 41	20	
223	Trans med trk co (ego)-----	55-18E	1,091.6	1 2 3	41	32 62		
224	Trans med trk co (petrl)-----	55-18E	1,131.6	3 1 2 3		64 64	32	
225	Trans med trk co (refrg)-----	55-18E	894.1	3 1 2 3		51 51	25	
226	Trans msl transport sqd-----	55-18E	(1)	3 1 2 3		12 12	6	
227	Trans car co, army-----	55-19E	210.1	1 2 3	13	1 12		
228	Trans ego carr co (tracked)-----	55-27C	185.9	1 2 3	13	11	5	
229	Trans hv trk co-----	55-28D		1 2 3				(4)
230	HQ & HQ det, trans tac carr bn-----	55-46D	62.3	1 2 3	4	3	2	
231	Trans tac carr co-----	55-47D	1,290.3	1 2 3	29	57 74	37	
232	HQ & HQ det, trans transport acft bn.	55-56D	74.9	1 2 3	5	4	2	
233	Trans lt hel co-----	55-57D	119.6	1 2 3	7	1 7	4	
234	Trans amph trk co-----	55-137D	392.0	1 2 3	6	20 22	11	
235	HQ & HQ det, trans mov gp-----		(1)	1 2 3	4	4	2	
	(AE, LF)-----	55-500R						
	(CA, DA, DC)-----	29-500D						
236	HQ & HQ det, trans mov bn-----		(1)	1 2 3	7	6	3	
	(AD, LA, 2 LE, 3 LC, 3 LD)-----	55-500R						
237	Trans highway reg pt team (GG)-----	55-500R	(1)	1 2 3	1	1		

See footnotes at end of table.

1	1	2	3	4	5	6	7	8
	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
238	Trans intel coll team (HA).....	55-500R	(1)	1 2 3	3	2	1	
239	Trans intel rsch team (HB).....	55-500R	(1)	1 2 3	1	1		
240	<i>Army Security Agency:</i> HQ & HQ co, ASA gp (field army).....	32-52D	320	1 2 3	22	19	10	(7)
241	HQ & HQ co, ASA bn (corps).....	32-56E	282	1 2 3	19	16	8	(7)
242	ASA op co (A).....	32-67E	445	1 2 3	30	25	13	
243	ASA co (proc).....	32-77D	334	1 2 3	23	19	10	
244	ASA co (scty).....	32-78D	223	1 2 3	15	13	7	
245	ASA div spt co (inf or abn).....	32-57F	377	1 2 3	25	22	11	
246	ASA div spt co (armd or mech).....	32-57F	422	1 2 3	28	24	12	

¹ Aircraft requirements based only on weight and dimensions of major items of equipment, to include vehicles and trailers.

² Does not include Army aircraft. Data for computing aircraft requirements for Army aircraft are contained in paragraph 7.44c.

³ Not transportable in medium transport aircraft (See (3)(f)4 above).

⁴ Not air-transportable. (See (3)(f)5 above).

⁵ When equipped with M113's and T257's, battalion aircraft requirements are satisfied by C-124's and C-141's, which are required to transport items of equipment weighing in excess of the C-130's allowable cargo load.

⁶ Does not include main armament ammunition.

⁷ Includes augmentation for vehicles but not for aircraft.

(c) Miscellaneous.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
2	Headquarters: HQ & HQ co, army -----	51-1D and 2D	277.0	1 2 3	17	1 16		
3	HQ, sp trp, army -----	51-3D	16.0	1 2 3	1	1	8	
4	HQ & HQ co, corps or abn corps----	52-1D and 2D	167.0	1 2 3	11	9	5	
	Replacement units:			2 3		2	1	
5	HQ & HQ det, repl bn-----	12-56E	29.0	1 2 3	2	1		
6	Repl co-----	12-57E	16.0	1 2 3		1		
7	Adjutant general: APU type A-----	12-605D	11.0	1 2 3	1	1		
8	APU type C-----	12-605D	20.0	1 2 3	2	2		
9	APU type F-----	12-605D	23.3	1 2 3	2	2		
10	APU type H-----	12-605D	33.0	1 2 3	2	2	1	
11	APU type J-----	12-605D	35.9	1 2 3	3	3	1	
12	BPO type O-----	12-520D	16.0	1 2 3	2	1		
13	BPO type T-----	12-520D	53.0	1 2 3	4	3	2	
14	Data proc unit type Z (mbl) (aug)---	12-510E	77.0	1 2 3		4 4	2	
15	Data proc unit type Z (consol aug) (mbl).	12-510E	(2)	1 2 3		4 4		
16	Army band-----	12-107E	9.0	1 2 3	1	1	2	

See footnotes at end of table.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
17	Pstl reg det.....	12-47D	(2)	1	2			
				2		2		
				3			1	
18	SPS co.....	12-17D	216.2	1	7	7		
				2		12		
				3			6	
	<i>Finance:</i>							
19	Fin disb sec (AE, FJ, GB).....	14-500D	(2)	1	1			
				2		1		
				3				
	<i>Civil affairs:</i>							
20	CA gp (fld army).....	41-500D	159.0	1	10			
		29-500D		2		9		
				3			5	
21	CA co (corps).....	41-500D	199.0	1	13			
		29-500D		2		11		
				3			6	
22	CA plat (div).....	41-500D	32.0	1	2			
				2		2		
				3			1	
	<i>Judge Advocate General Corps:</i>							
23	JAGC det HQ team (AA).....	27-500E	(2)	1	1			
				2		1		
				3				
24	JAGC det HQ team (AB).....	27-500E	(2)	1	1			
				2		1		
				3				
25	JAGC claims svc team (FA).....	27-500E	(2)	1	1			
				2		1		
				3				
26	JAGC claims svc team (FB).....	27-500E	(2)	1	2			
				2		1		
				3				
27	JAGC war crimes team (GA).....	27-500E	(2)	1	1			
				2		1		
				3				
28	JAGC war crimes team (GB).....	27-500E	(2)	1	1			
				2		1		
				3				
29	JAGC GCM trial team (HA).....	27-500E	(2)	1	1			
				2		1		
				3				
30	JAGC GCM trial team (HB).....	27-500E	(2)	1	1			
				2		1		
				3				
31	JAGC legal asst team (IA).....	27-500E	(2)	1	1			
				2		1		
				3				
32	JAGC legal asst team (IB).....	27-500E	(2)	1	1			
				2		1		
				3				

See footnotes at end of table.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel equipment and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-130	C-124	C-141	
33	<i>Special warfare:</i> Psych warfare repro det.....	33-57D	(2)	1 2 3	10	3 11	6	
34	Psych warfare consol co (AC, 3 AA, 3 FA, 12 HA, 3 IA, KA, 3 MA).	33-600D	(2)	1 2 3	25	22	11	
35	<i>Historical:</i> Mil hist det.....	20-17E	(2)	1 2 3	1	1		
36	<i>Public information:</i> Press camp HQ team (AA).....	45-500E	(2)	1 2 3	1	1		
37	Pub info op team (BA).....	45-500E	(2)	1 2 3	1	1		
38	Cmlt correspondent team (BD).....	45-500E		1 2 3				Only one individual with personal equipment.
39	Pub info op team (aug) (BE).....	45-500E	(2)	1 2 3	1	1		
40	Pub info op team (aug) (BF).....	45-500E	(2)	1 2 3	1	1		

¹ Not transportable in medium transport aircraft. (See (3) (f) 4 above).

² Aircraft requirements based only on weight and dimensions of major items of equipment, to include vehicles and trailers.

4-13. Movement by Water (fig. 4-21)

a. *General.* Capacities of ships and craft, sea distances, steaming rates, turnaround times, and factors for cargo shipping are contained in chapter 7.

b. *Assault Landings Over Beaches.*

- (1) *Beach analysis and selection.* Strategic considerations aside, the selection of a beach for an assault landing is based upon the potential of the beach and hinterland to permit the initial landing and the followup logistical support of the forces required for the

operation. From a logistical standpoint, the most important considerations are the characteristics of the beach, beach exits, and hinterland and the forecast weather conditions as they influence the ability of the service forces to support and maintain the forces ashore. Increased use of helicopters and amphibious vehicles makes possible the use of less desirable beach areas in the initial assault. Under new concepts of operation and with the employment of nuclear weapons, dispersal of forces and supplies will be necessary; therefore, emphasis will be placed on the analysis and selection of

many small beaches, adequately linked by lines of communication, rather than a few long ones as in the past.

- (2) *Considerations in selecting.* A detailed investigation and thorough study should be made of the hydrography and topography of the landing area,

as well as of the long-range forecasts of the weather that may be encountered. The factors of primary importance to be considered when selecting beaches for assault landings are as follows (the diagram below depicts certain of the features discussed):

GENERAL BEACH PROFILE DIAGRAM
(TIDAL SEA)

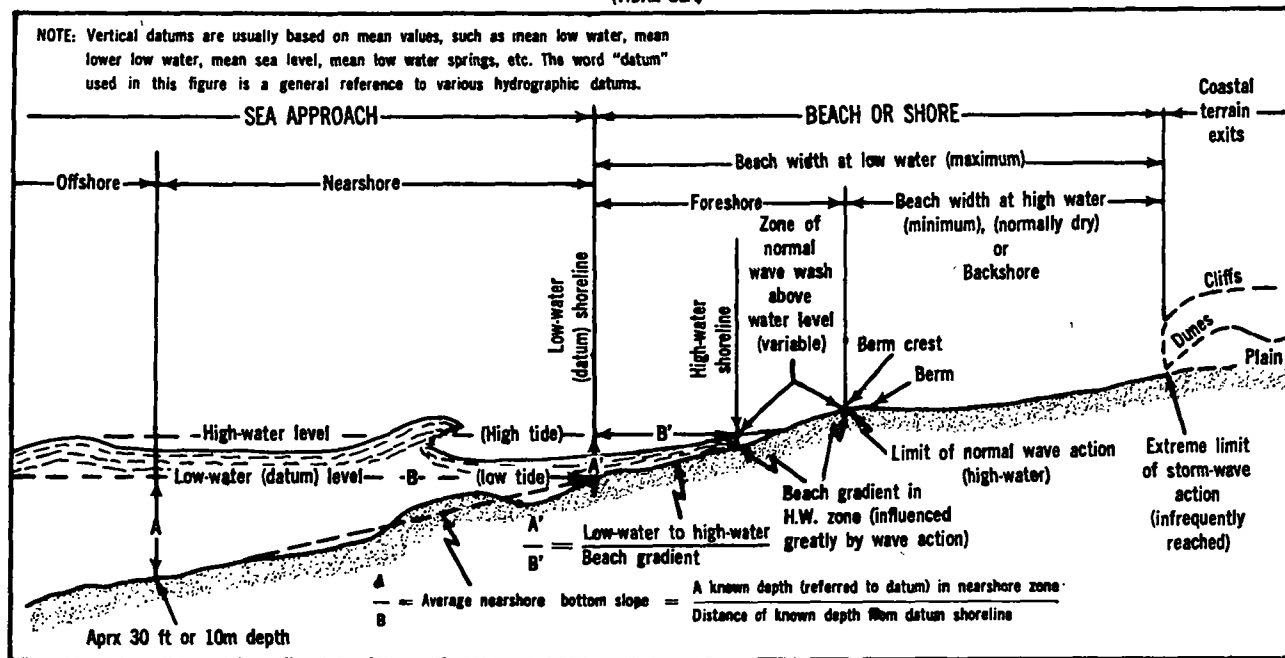


Figure 4-21

- (a) *Tides.* The stages of the tide, the tidal range, and the tidal currents are considered as they affect the passage of underwater obstacles, offshore bars, reefs, or shoals, the beaching or stranding of landing craft, and the width of the beach available for operations.

- (b) *Surf.*

1. Waves breaking onto a beach (surf) may cause landing craft to broach to. This necessitates a study of surf in connection with landing operations. Surf action is dependent on wind, tide, and the depth of water. On flat nearshore bottoms, waves break and are spent before reaching

the shoreline. Over steep slopes, the surf breaks near the shore and consequently will have more effect on the beaching of craft. Waves usually break over reefs where they exist, and thus leave the inner area relatively unaffected. Surf conditions can be predicted or forecast hours, and in some cases days, in advance for almost all shores of ocean areas for which regular weather reports are received. Waves created by distant storms may break on a shore with a high or heavy surf, even while local weather conditions are otherwise ideal. Surf forecasts should cover the entire

operation and should be available for use as long as any operations across the unprotected beaches are necessary.

2. The height of the surf markedly affects the satisfactory operation of amphibians and landing craft. LARC 5's experience a 50-percent reduction in effectiveness when the height of the surf reaches 3 feet; LARC 15's when the height is 4 feet; and LARC 60's when the height reaches 6 feet. Except during emergencies, operation is usually suspended when the surf exceeds 5 feet for LARC 5's; 6 feet for LARC 15's; and 8 feet for LARC 60's. LCVP's are effective when the surf is not greater than 3 feet, LCM's can operate satisfactorily in a surf of not more than 5 feet and LVTP 5's are effective through surf up to 8 feet in height.
- (c) *Nearshore bottom gradient.* Gently sloping bottom gradients cause landing craft to ground at a considerable distance from the shoreline, which increases the hazard and time of unloading. Beaches with steep gradients are subject to heavy surf. Since a steep gradient usually extends shoreward from the waterline, difficulty in moving vehicles and cargo off the beach can be anticipated. A beach gradient of 1 to 20 (1 foot increase in water depth each 20 feet seaward from the waterline) is nearly ideal for the operation of landing craft and amphibious vehicles.
 - (d) *Reefs.* In many places, reefs or shoals fringe the shorelines and must be studied prior to beaching operations. A minimum depth of water of 6 feet should be available over reefs or shoals at low tide to permit the low-water operation of landing craft. This is not the normal situation since most reefs are either very close to the surface or entirely exposed at low tide, in which case certain craft must operate at high tide only. A minimum depth of water of 11 feet at low tide is required for the operation of LST's. Reefs or shoals which limit operations should be avoided in the selection of beach sites.
 - (e) *Weather.* Predicted weather conditions must be considered in relation to the projected operation. Adverse weather conditions and their effects upon tide and surf may make the operations too hazardous, or impossible. Haze or fog conditions may be advantageous or disadvantageous, depending on overall considerations of the operation in question. The weather considerations should cover the entire operation and ensure favorable conditions for not only the assault landings but also the followup and buildup phases.
 - (f) *Topographic.* Having effected a lodgment ashore, the landing forces will be confronted with expanding the beachhead and general movement inland. Here topographic features are of immediate importance. Consideration should be given to overall length of beach; degree of access to the interior from the beach (number of corridors and utility of each, the existing road net and means of reaching it from the beach); areas suitable for supply dumps (both in the beach area and inland); areas suitable for airstrips, airdrops, helicopter landing sites, and cover and concealment. It is important that each of these factors be analyzed with respect to the advantages or disadvantages that a particular site may offer.
 - (g) *Equipment.* Requirements for equipment to unload supplies over the beach must be determined by beach characteristics. If available

equipment will not be adequate, early effort must be directed toward the procurement of sufficient amounts of the proper types.

- (h) *Enemy action.* This may take either an active or a passive form. Active enemy action includes the use of existing defense installations, established fields of fire, and employment of the defending forces. Enemy air and naval capabilities also must be considered. Passive enemy action includes obstacles, demolitions, and mines in water adjacent to the beach, on the beach, and immediately inland. All these will affect the ability of the service troops to furnish the necessary logistical support.
- (i) *Troop availability.* An analysis must be made of troops available for the operation which will include the degree of training, experience, and general suitability of both combat and service elements for the operation under consideration.
- (j) *Time.* The time and place for launching an operation are decided after an analysis of the factors discussed in (a) through (i) above. In addition, the exact time (week, day, and hour) for the assault will be influenced by visibility (as it affects surprise and operations) in the relative number of hours of darkness, moonlight, and daylight. Whether the landing is made in darkness or daylight is determined largely by the relative effectiveness of the fire and support of the assaulting and defending forces.
- (3) *Beach capacity for assault landing.*
 - (a) *Size of beaches.* The number of troops which can be landed simultaneously in assault over a given beach is the result of a combination of factors. The tactical formation employed by the assault troops

should be the dominant factor, providing safety precautions and good judgement are not sacrificed. In general, the length of beach required for landing an infantry brigade will vary with its task organization.

- (b) *Time and space factors for landing craft and amphibious vehicles.* The interval between landing craft or amphibious vehicles landed simultaneously on a beach will vary from 45 meters to 90 meters, or an average of 68 meters. The time interval between waves will vary from 1 minute to 15 minutes.
- (c) *Average landing times.* The combat elements of a battalion landing team (BLT) require approximately 2 hours to land over one landing beach utilizing 17 landing vehicles, tracked Howitzer (LVTH) and 15 landing vehicle, tracked, personnel (LVTP).
- (d) *Assault shipping requirements.* When employed in the assault, the reinforced infantry division task organization will typically provide for assault battalion landing teams, a division artillery grouping, a division reserve grouping, a division shore party grouping, and a division combat service grouping. The reinforced armored division may be employed as an assault division, also. Assault shipping, required for a reinforced infantry division will vary according to the tactical mission and length of voyage.
 1. For long voyages (10 days, for example), primary consideration must be given to provision of the type of shipping that will negotiate the distance at a suitable speed and that will best accommodate the embarked troops. APA's and AKA's meet these requirements better than landing ships. Assault shipping for a

reinforced infantry division for an extended voyage, therefore, conforms to the following general pattern:

	1	2	3	4	5	6
1	Type ship	Personnel	Vehicles	Number of ships	Total personnel	Total vehicles
2	APA ----	1,500	50	10	15,000	500
3	AKA ----	300	120	2	600	240
4	LST ¹ ----	450	60	25	11,250	1,500
5	LSD ¹ ----	200	50	7	1,400	350
6	LPH ----	1,400	0	4	5,600	0
7	Total	-----	-----	-----	33,850	2,590

¹ Number of landing ships varies in proportion to number of amphibious vehicles, ground combat vehicles, and LCU's and LCM's to be carried.

2. For short voyages (48-72 hours, for example), accommodation of embarked troops can be subordinated to provision or the most suitable shipping for ease and efficiency in loading and unloading. Landing ships meet these requirements better than APA's and AKA's especially when ground combat vehicles and amphibious vehicles are considered. Assault shipping for a reinforced infantry division for a short voyage, therefore, conforms to the following general pattern:

	1	2	3	4	5	6
1	Type ship	Personnel	Vehicles	Number of ships	Total personnel	Total vehicles
2	APA ----	1,500	50	1	1,500	50
3	AKA ----	350	120	2	700	240
4	LST ¹ ----	400	60	50	20,000	3,000
5	LSD ¹ ----	300	50	7	2,100	350
6	LPH ----	2,000	0	4	8,000	0
7	Total	-----	-----	-----	32,300	3,640

¹ Number of landing ships varies in proportion to number of amphibious vehicles, ground combat vehicles, and LCU's and LCM's to be carried.

3. The number of vehicles lifted in the assault shipping for a short voyage greatly exceeds the number lifted in the assault shipping for a long voyage. This is because the landing

ships carry a balanced personnel and vehicle load as compared with APA's, which carry large numbers of personnel but few vehicles. The increased use of LVT's and helicopters in the ship-to-shore movement will generally increase the use of LST, LSD, and LPH type ships in the amphibious assault, with a resultant decrease in the numbers of APA type ships.

4. Available shipping will always affect the composition of assault shipping. Efficient loading and allowable overloads likewise affect the number of personnel and vehicles that can be loaded. For example, it was common in both Europe and the Pacific in World War II to load 500 troops on LST's.
- (e) *Vehicles and supply.* In loading assault craft, vehicles or supplies may be substituted for men on the basis of space or weight, whichever is the determining factor in each case. The boat space occupied by one man and his individual equipment normally is considered to be 224 pounds, 13.5 cubic feet or 3 square feet.
- (4) *Logistics.* The logistic plan for an amphibious operation must complement and implement the scheme of maneuver ashore.

c. River Crossing.

- (1) *Bridges.* In a assault on a river line, the number of bridges provided for each tactical unit will vary widely, depending on many factors. Some of these are width of river, stream velocity, the available road net, trafficability of the soil, the types and amounts of equipment available, and the number of available engineer troops. As a rule, at least two floating bridges to take division loads will be necessary within the zone of each assault division. These bridges normally will be supplemented by one additional bridge per corps zone and at least one in the field army zone.

Theater army logistical command troops ordinarily will provide a railroad bridge in the zone of each field army.

- (2) Ferries. In addition to the factors discussed above, the numbers and types of ferries used will be affected by the number of bridges planned and by the extent to which landing craft and amphibious vehicles are employed. For narrow streams, it frequently

will be more economical to construct a bridge at each available site than to use ferries. On the other hand, in crossing a wide river when the construction of bridges will be delayed, ferries of all types will be used to the greatest degree possible.

- (3) Detailed characteristics of assault boats, bridging, and ferry equipment are shown in paragraphs 4-28 and 4-29.

Section III. TRAINING AREAS AND FACILITIES

4-14. Maneuver Area

a. Current doctrine on the employment of divisions in both nuclear and nonnuclear warfare increases the requirements for training areas in size and for variety in types of terrain, cover, and concealment. The increased versatility and range of infantry, armor, and artillery weapons; the increased use of aircraft

for the mobility of divisional units; and the requirements for greater dispersion of units within a tactical area have outmoded prior concepts of both field exercise areas and firing and impact areas. Consequently, installations which have previously been utilized for the training of divisions are no longer capable of meeting present day requirements.

b. Data on installation areas in approximate acreages are as follows:

	1	2	3	4	5	6	7
1	Type units	Approximate number of troops	Cantonment area	Miscellaneous activities area	Field exercise area	Firing and impact area	Total
2	Inf div.....	¹ 30,000	2,200	1,000	50,000	140,000	143,200
3	Inf div (mech).....	¹ 30,000	2,200	1,000	70,000	140,000	213,200
4	Armd div.....	¹ 30,000	2,200	1,000	70,000	140,000	213,200
5	Abn div.....	¹ 30,000	2,200	1,000	50,000	² 90,000	143,200
6	Corps troops.....	³ 30,000	2,400	1,000	10,000	40,000	53,400
7	Air defense artillery firing center.....	⁴ 2,500	⁴ 250	⁴ 150	⁵ 6,000	⁵ 70,000	76,400
8	Tank firing center.....	⁶ 2,500	⁶ 250	⁶ 150	Not required	140,000	140,000

¹ Includes divisional, nondivisional, and supporting troops (aggregate strength).

² Consideration must be given to cleared areas for drop zone and assault transport landing areas. An airdrome capable of taking large transports should be nearby. An airborne division maneuver area should contain an airfield, capable of handling large airplanes, immediately adjacent to the cantonment area. One or more large drop and assault transport landing zones should be located near the cantonment area, and the others scattered throughout the maneuver area. At least one such zone should be located adjacent to the firing and impact area to permit conduct of small-unit problems using live ammunition.

³ Normal assignment of corps troops plus one-third of normal field army engineer and field army air defense artillery units.

⁴ Per group of 3 AW battalions.

⁵ Provides position areas and danger areas for simultaneous firing of the 8 battalions through 45° safety angle. Danger area may be sited over water.

⁶ Per 3 tank battalions and proportionate station overhead.

c. Corps Field Training Exercise. A maneuver area of approximately 4,000,000 acres is required for a corps level exercise which involves three divisions and a normal corps slice

of combat and administrative support units. An impact area of 15,000 acres should be available within or adjacent to the maneuver area to accommodate live firing exercises.

4-15. Training Facilities for Infantry, Infantry (Mech), Airborne, and Armored Divisions

a. The cantonment area should be located near the perimeter of the land available, accessible to highways and railroads facilities. The area should provide all housing, storage, railroad yards, administration, shops, close-in training areas, miscellaneous training courses, and recreational facilities. For a functional layout of division-type camps, see OCE drawing number E-16-06-21 and E-16-06-22 obtainable from Office, Chief of Engineers. See also appropriate AR's in the 210-series.

b. The miscellaneous activities area includes the station hospital, airfields, division review field, and other administrative activities not included in the cantonment area.

c. The field exercise area includes all available land except that used for cantonment, miscellaneous activities, and firing and impact area. Portions of the firing and impact area not in use when the exercises are conducted may be utilized as field exercise area. It is desirable that this area contain streams or lakes for training in construction of fixed and floating bridges. Landing strips for organic aircraft should be located at several places in the field exercise area. The area for an airborne division should contain several cleared areas suitable for use as drop and landing zones.

d. Firing and impact area permits the firing of all ranges simultaneously, except, in some cases, those whose impact areas are superimposed. For suggested layout, see AR 210-21. For safety requirements, see AR 385-63. This area should be of varied terrain with suitable

locations for ground observation points. The impact area may be submarginal or swamp land.

e. The division review field should be an area at least 220 by 1,400 meters, adjacent to or near the cantonment area.

f. Drill fields should be located in close proximity to each battalion.

g. The landing field should be available in the vicinity of the cantonment area for use by organic aircraft.

h. Four airfields capable of meeting minimum standards under favorable weather conditions for current and planned assault transport aircraft should be provided in the field exercise area for training in air-landed operations.

i. An airfield suitable for use by large numbers of transport aircraft should be on or near the installations. It is desirable to have other airfields, suitable for use by Air Force aircraft, within 1 day's march of an airborne division installation.

j. The close-in training area, in order to permit the maximum use, should be located in close proximity to the housing area.

k. Ranges for the infantry, airborne, and armored division posts may be found listed in AR 210-21, together with the number of ranges, positions, lanes, bays, or firing points required for each type of unit, also the drawing number from which they may be constructed and the appropriate training manual reference.

4-16. Umpire Requirements

For umpire requirements, see FM 105-5.

Section IV. TACTICAL OPERATIONS

4-17. Characteristics of Weapons

a. Vehicular Weapons, Combat Vehicles (Less Artillery)

	1	2	3	4		5
1	Vehicle	Primary weapons	Rate of fire (rd per min)	Max range (meters)	Max effective range	Approx bursting area (meters)
2	Gun, 40-mm, SP, M42A1.	Gun, 40-mm, dual auto M2A1.	240	4,600 HE-T 8,600 AP-T	4,600 HE-T	-----
3	Gun, 90-mm, SP, full, tracked, M56.	Gun, 90-mm, M54-----	8	16,800 AP-T 11,350 HVAP-T 6,350 HEAT-T 17,800 HE, WP 15,800 HE-T, WP-T	2,000 AP-T 2,000 HEAT 4,600 HE	37 x 11 (AP-T)
4	Mortar, 107-mm, SP, full tracked, M84.	Mortar, 107-mm, M30-	Norm 6, Max 20	5,450 HE 4,600 CHEM 4,800 ILLUM	5,449 HE	40 x 14 (HE)
5	Tank, cmbt, full tracked, M41A1.	Gun, 76-mm, M32-----	4	14,700 AP-T 21,600 HVAP-IDS-T 9,900 HVAP-T 14,350 HE 14,700 WP	2,000 AP-T 4,600 HE	30 x 5 (AP-T)
6	Tank, cmbt, full tracked, M48A2.	Gun, 90-mm, M41-----	4	16,800 AP-T 11,350 HVAP-T 6,350 HEAT-T 17,800 HE, WP 15,800 HE-T, WP-T	2,000 AP-T 2,000 HEAT 4,600 HE	37 x 11 (AP-T)
7	Tank, cmbt, full tracked, M60A1.	Gun, 105-mm, M68----	4	36,700 APDS-T 8,200 HEAT-T 9,500 HEP-T	2,000-4,400 HEAT 2,000 APDS- T	40 x 8 (HEP-T)
8	Tank, cmbt, full tracked, M103A1.	Gun, 120-mm, M58----	4	23,100 AP-T 18,200 HE-T 26,950 WP-T	2,000 AP-T 4,600 HE	46 x 8 (HE-T)

Note. Maximum range is estimated at 45 degree elevation.

b. Infantry Weapons.

1	2	3	4	5	6	7
Weapons	Maximum rate of fire (rd/min) ¹	Sustained rate of fire (rd/min) ²	Maximum effective rate of fire (rd/min) ³	Maximum range (meters) ⁴	Maximum effective range (meters) ⁵	Approximate effective bursting area (meters)
2 Carbine, cal. .30, M2	750-775	40-60	40-60	2,025	250	N/A
3 Flamethrower, ptbl, M2A1-7		6-9 sec	6-9 sec			N/A
4 Unthickened fuel				20	20	
5 Thickened fuel				45	45	
6 Flamethrower, ptbl, M9-7		5-8 sec	5-8 sec			
7 Unthickened fuel				20-25	20-25	
8 Thickened fuel				40-50	40-50	
9 Grenade, hand, frag, M26A2				40		15
10 Grenade, hand, and rifle, WP, M34				35		35
11 Grenade, rifle, HEAT, M31	4	4	2	275	115	N/A
12 Gun, mach, cal. .50, HB, M2	450-500	40	100	6,800		N/A
13 AA target					725	
14 Ground target					1,825	
15 Gun, mach, cal. .30, M1919A6	600-675	75	150	3,200		N/A
16 AA target					640	
17 Ground target					1,100	
18 Gun, mach, 7.62-mm, M60	550	100	200 (rapid rate)	3,725	1,100	N/A
19 Gun, submach, cal. .45, M3A1	450	40-60	40-60	1,550	100	N/A
20 Launcher, grenade, 40-mm, M79				400		5
21 Area targets					350	
22 Point targets					150	
23 Launcher, rkt, 3.5-in. M20A1B1	18	4		825		18 x 9 (HEAT)
24 Moving					185	
25 Stationary					275	
26 Missile, at/tank, SS-10(on 1/4-ton truck)	2-3	2-3		1,600	450	N/A
27 Light, at/tank, wpn, 66-mm, M72				1,000	230-325	Classified
28 Missile, at/tank, ENTAC	2-3	2-3		2,000	2,000	N/A
29 Light wpn, Davy Crocket, M28				2,000	2,000	Classified
30 Heavy wpn, Davy Crocket, M29				4,000	4,000	Classified
31 Mortar, 81-mm, M29, w/mount M23A3	12 for 2 min w/ charge 8.	3w/charge 8	12 for 2 min w/ charge 8.	3,650	3,650	25 x 20
32 Mortar, 107-mm, M30	20 for first 2 min 6 per min next 20 min.	2	20 for first 2 min 6 for next 20 min 2 indefinitely.	5,500	5,500	40 x 15

See footnotes at end of table.

	1	2	3	4	5	6	7
1	Weapons	Maximum rate of fire (rd/min) ¹	Sustained rate of fire (rd/min) ²	Maximum effective rate of fire (rd/min) ³	Maximum range (meters) ⁴	Maximum effective range (meters) ⁵	Approximate effective bursting area (meters)
33	Rifle, 90-mm, M67-----	1 per 6 sec not to exceed 5, then 15-min cooling period.	1 per min indef-----	-----	2,200 approx-----	400-750 approx-----	-----
34	Rifle, 106-mm, M40A1-----	1 per 6 sec not to exceed 5, then 15-min cooling period.	1 per min indef-----	-----	7,678-----	1,100-2,200-----	14m radius (HEP-T)
35	Weapon, apers, M18A1-----	1 shot-----	-----	1 shot weapon-----	250-----	Most effective 50--	50
36	Pistol, auto, cal. .45, M1911A1-----	35-42-----	10-----	21-28-----	1,500-----	50-----	N/A
37	Rifle, auto, cal. .30, M1918A2-----	350 slow 550 fast 120-150 ¹ .	40-60-----	40-60 two or three rd bursts. 120-150 20 rd bursts.	2,750-3,200-----	460-----	N/A
38	Rifle, cal. .30, M1-----	-----	8-10-----	16-24-----	3,200-----	460-----	N/A
39	Rifle, 7.62-mm, M14-----	700-750-----	-----	-----	3,725-----	460-----	M/A
40	Semiautomatic-----	-----	15-----	20-40-----	-----	-----	-----
41	Automatic-----	-----	20-----	40-60-----	-----	-----	-----

¹ Maximum rate of fire—greatest rate at which well-trained gunner can fire.

² Sustained rate of fire—rate at which weapon can fire indefinitely without seriously overheating.

³ Maximum effective rate—rate at which trained gunner can fire and obtain reason-

able number of hits (50%).

⁴ Maximum range—greatest distance weapon will fire.

⁵ Maximum effective range—greatest distance at which gunner may be expected to fire accurately.

c. *Artillery Weapons.*
 (1) Air defense artillery.

1	2	3	4	5	6	7
Weapon	Time to Emplace	Maximum rate of fire (rd/min)	Range (Meters)			
			Horizontal		Vertical	
			Maximum	Fuse Limit	Maximum	Fuse Limit
ADA Missile System NIKÉ- HERCULES.	(1)	(1)	Over 139 km ¹	(1)	Over 30.5 km ¹	(1)
ADA Missile System HAWK-----	(2)	(2)	(2)	(2)	(2)	(2)
Gun, twin 40-mm, SP, M-42 ³ -----	-----	240	⁴ 5,050	5,050 (12 sec)	5,050	5,050 (12 sec)

¹ See FM 44-1A for classified characteristics.

² See FM 44-96A for classified characteristics.

³ Effective killing range is approximately 1200 meters.

⁴ For tactical planning 1828 meters.

(2) (a) Field artillery cannon/rockets.

1	Item	Traveling Weight (Pounds)	Maximum Range (Meters)	Time To Emplace (Minutes) s	Traverse Limits (Mils) From Center	Elevation Limits (Mils)	Rate of Fire Rd/Min		Air Transportability	Water Crossing Capability	Effective Area of Burst (Meters)	
							Maximum	Sustained			Lateral	Range
2	75-mm pack How M116.....	1,440	8,800	7	53R 53L	-89 +100	8	2½	Phase I	Floatable.....	20	15
3	105-mm How M101A1.....	4,980	11,000	3	409R 400L	-89 +1,156	4	1½	Phase I	Floatable.....	30	20
4	105-mm XM124 (Aux) (SP).....	5,760	11,000	3	409R 400L	-89 +1,156	4	1½	Phase I	Floatable.....	30	20
5	105-mm How M52A1 (SP).....	53,000	11,000	1	1,066R 1,066L	-178 +1,156	4	1½	Phase III	Floatable (48-inches)	30	20
6	105-mm How M102.....	3,060 Appr	14,700 11,500	5	6,400	-89 +1,300	10	3	Phase I	Floatable.....	30	20
7	105-mm How M108 (SP).....	46,221	14,700 11,500	1	6,400	-100 +1,330	10	3	Phase III	Amphibious W/Kit	30	20
8	105-mm How XM104 (SP).....	8,600	14,700 11,500	1	398R 398L	-89 +1,342	10	3	Phase I	Amphibious.....	30	20
9	155-mm How M123 (Aux) (SP).....	13,540	14,600	5	448R 418L	0 +1,156	3	1	Phase I	Fordable (30-inches)	50	30
10	155-mm How M44A1 (SP).....	64,000	14,600	1	533R 533L	-89 +1,040	3	1	Phase III	Fordable (42-inches)	50	30
11	155-mm How M109 (SP).....	52,460	18,000 14,600	2	6,400	-53 +1,333	3	1	Phase III	Amphibious W/Kit	50	30
12	155-mm How M114A1.....	12,950	14,600	12	448R 418L	0 +1,156	3	1	Phase I	Fordable (30-inches)	50	30
13	8-inch How M115.....	29,700	16,800	20	533R 533L	-36 +1,156	1	1 Per 2 Min	Phase III	Fordable (60-inches)	80	30
14	8-inch How M55 (SP).....	98,000	16,800	1	533R 533L	-89 +1,156	1	1 Per 2 Min	Phase III	Fordable (42-inches)	80	30
15	8-inch How M110 (SP).....	58,500	16,800	2	533R 533L	-35 +1,156	3	1 Per 2 Min	Phase III	Fordable (42-inches)	80	30
16	175-mm gun M107 (SP).....	62,100	32,800	3	533R 533L	0 +1,156	3	1 Per 2 Min	Phase III	Fordable (42-inches)	95	35
17	280-mm gun M66.....	166,630	28,500	12	6,400	0 +978	4	1 Per 4 Min	NA	Fordable (60-inches)	60	65
18	2.75-inch aerial rkt, XM3.....		3,000	NA	6,400	NA	4 Sec 48 Rds	4 Sec 48 Rds	Phase I	NA		
19	115-mm M91 mult rkt lchr.....	1,200	10,600	30	178R 178L	-14 +1,067	15 Sec 45 Rds (2)	15 Sec 45 Rds (2)	Phase I	Fordable (30-inches)	(4)	(4)

20	Little John Mgr-3A (M51)-----	2,233	20,400	10	267R	0	3 Rd/	(2)	Phase I	Fordable	(4)	(4)
					267L	+978	Lchr/Hr			(21-inches)		
21	Honest John Mgr-113 (M50)-----	38,975	39,000	15	267R	0	2 Rd/	(2)	Phase II	Fordable	(4)	(4)
					267L	+1,244	Lchr/Hr			(30-60-inches)		
22	Honest John Mgr-1A (M31)-----	40,175	24,000	15	267R	0	2 Rd/	(2)	Phase II	Fordable	(4)	(4)
					267L	+1,244	Lchr/Hr			(30-60-inches)		

¹ Use this value for extended range ammunition.² Normally march ordered following each firing.³ Times given are for entering a minimally prepared position and report "Laid and Ready to Fire."⁴ Classified. See FM 101-10-3, paragraph 4-7.*(b) Field artillery missiles.*

WEAPONS ⁽¹⁾	Minimum and maximum range (approx)	Water fording capability (inches)	Guidance	Propulsion	Mobility	Missile prime mover	Field of fire (mils) (from center)	Launch elevation (mils)	Missile		
									Length (meters)	Weight (pounds)	Diameter (centimeter)
LACROSSE	8.0 km to 30.1 km	24	Command	Solid Propellant	Air Phase II Veh 100%	2½ Ton Trk M398	266R 266L	+89 to +1,244	5.8521	2,344	52.07
CORPORAL	50 km to 130 km	60	Command and Preset	Liquid Bi-Propellant	Air-Phase III Veh 100%	Transporter Erector M-2	Classified	+1,600	13.7160	11,500	77.20
SERGEANT	30 km to 135 km	30	Inertial	Solid Propellant	Air Phase II Veh 100%	5-Ton Tractor, M52	6,329	+1,333	10.3632	10,000	78.74
REDSTONE	93 km to 324 km	30	Inertial	Liquid Bi-Propellant	Air Phase III Veh 100%	3 each 5-ton Tractor M52	6,400	+1,600	21.0312	62,100	177.80
PERSHING	Classified	42	Inertial	Solid Propellant	Air Phase II Veh 100% Helicopter	XM474	6,400	+1,600	10.3632	10,275	101.60
LANCE	Classified	Classified	Simplified Inertial	Storable Prepackaged Liquid Propellant	Air Phase I Veh 100% Helicopter	XM410E1	6,400	Classified	Classified	Classified	Classified

¹ All systems listed have nuclear capability.

(3) Field artillery barrages and concentrations.

(a) *Barrages.* A barrage is a special type of prearranged fire placed on a line. The data contained in the following tables are approximate and will vary for different charges and terrain.

1	2 Weapon (caliber & type)	3 Area effectively covered by one projectile ¹ (width x depth) (meters)	4 Radius of large fragments (meters)	5 Width of Battery Barrages (Meters)			6 Permissible Number of Rounds Per Piece	
				7 Size of Battery			8 Maximum RPM 1st 3 minutes	9 Sustained (RPM)
				10 2-piece	11 4-piece	12 6-piece		
2	105-mm Howitzer.....	30 x 20	175	---	---	180	M101A1 10	3
							M52A1 10	3
							M108 10	3
							M102 10	3
							M104 10	3
3	155-mm Howitzer.....	50 x 30	360	---	---	300	M114A1 4	1
							M44A1 4	1
							M109 4	1
							M53 4	1
4	8-inch Howitzer.....	80 x 30	470	---	320	---	M115 1.5	.5
							M55 1.5	.5
							M110 1.5	.5
5	280-mm Gun (M66).....	60 x 65	680	240	---	---	-----	---
6	175-mm Gun (M107).....	95 x 35	520	---	380	---	M107 1.5	.5

¹ The area covered effectively is considered to be that area in which there is at least 50 percent chance that a man standing will become a casualty. The area is roughly elliptical.

(b) *Concentrations.* A concentration is a volume of fire placed on an area within a limited time.

	1	2	3	4	5
1	Area and Ammunition -----	UNIT			
		105-mm Bn \	155-mm Bn	175-mm Bn	8-inch Bn
		6-piece battery	6-piece battery	4-piece battery	4-piece battery
2	Approximate size of area covered (meters) ¹ ----	220 x 160	350 x 210	420 x 140	340 x 140
3	Amount of ammunition to cover (rounds)-----	72	72	60	60

¹ The area covered effectively is considered to be that area in which there is at least 50 percent chance that a man standing will become a casualty. The area is roughly elliptical.

4-18. Characteristics of Chemical Weapons, Agents, and Munitions

(For classified data, see FM 101-10-3, para 4-10.)

a. Characteristics of Chemical Weapons.

	1	2	3	4	5	6	7	8
1	Nomenclature	Weight		Transportation	Fuel (agent) tank capacity (approx)	Fuel (agent) consumption rate (approx)	Duration of contin- uous fire (approx) (sec)	Maximum effective range (meters)
		Empty (lb)	Filled (lb)					
2	Flamethrower, portable, M2A1-7.....	42	69	Man-carried.....	4.5 gal.....	0.5 to 0.75 gal/sec.	8	25 (unthickened fuel) 50 (thickened fuel)
3	Flamethrower, portable, ABC M9-7.....	26	50	Man-carried.....	4 gal.....	0.5 to 0.75 gal/sec.	8	25 (unthickened fuel) 50 (thickened fuel)
4	Flamethrower, mechanized, main armament, turret- mounted, M7A1-6 ¹			M48A2 Med tk.....	380 gal ²			
	With 3/4-in. nozzle.....					4.9 gal/sec.....	70	185 (thickened fuel) ³
	With 7/8-in. nozzle.....					5.7 gal/sec.....	60	230 (thickened fuel) ³
5	Flamethrower, mechanized, main armament, APC- mounted, M10-8 ⁴			M113 Armored personnel carrier.....	200 gal.....	6.2 gal/sec.....	32	183 (thickened fuel) ³
6	Generator, smoke, mechanical, pulse-jet, ABC- M3A3.....	130	⁵ 147	1/4-ton truck and trailer.....	No tank ⁶	25 to 40 gal/ hr ⁷	Continuous	Not applicable.
	Fog oil (SGF2).....							
7	Disperser, riot control agent, portable, M3.....	47		Man-carried.....				12 (range in still air)
	CS1.....		55		8 lb.....	0.4 lb/sec.....	19	
	CN1.....		67		20 lb.....	1.1 lb/sec.....	19	
8	Disperser, riot control agent, helicopter or vehicle- mounted, M4.....	160		Helicopter or 1/4- ton truck.....				12 (range in still air with gun).
	CS1.....		250		90 lb.....	45 lb/min.....	120	
	CN1.....		280		120 lb.....	60 lb/min.....	120	
9	Disperser riot control agent, helicopter or vehicle- mounted, M5.....	160		Helicopter or 1/4- ton truck.....				12 (range in still air with gun).
	CS1.....		210		50 lb.....	25 lb/min.....	120	
	CN1.....		178		108 lb.....	54 lb/min.....	120	

¹ When the M7A1-6 flamethrower is installed in a modified turret of M48A2 medium tank, the flamethrower and the hull of the tank comprise the M67A1 flamethrower tank which is an Ordnance item of issue.

² Initial capacity of clean tank is 300 gallons by pressure fill and 365 gallons by gravity fill; refill capacity of tank not cleaned is 355 gallons by pressure fill and 340 gallons by gravity fill.

³ Use of unthickened fuel is not recommended.

⁴ When the M10-8 flamethrower is installed in the M113 armored personnel carrier, the flamethrower and the carrier comprise the M132 self-propelled flamethrower which is an Ordnance item of issue.

⁵ Weight of generator after 3 1/2-gallon gasoline tank is filled; consumption rate of gasoline is 3 gallons per hour.

⁶ Fog oil is used from 55-gallon drum.

⁷ Normal consumption rate is 40 gallons per hour.

b. Characteristics of Chemical Agents.

	1	2	3	4	5
1	Name	Symbol	Odor	Effect on body	Method of dispersion
	<i>Toxic Chemical Agents</i>				
2	Distilled mustard (blister agent).	HD	Like garlic or horse-radish.	Injures eyes and lungs; blisters skin	Shell, bomb, landmine, spray tank
3	Mustard (blister agent) -----	H	Like garlic or horse-radish.	Injures eyes and lungs; blisters skin	Shell, bomb, landmine, spray tank
4	Mustard T-mixture (blister agent).	HT	Like garlic or horse-radish.	Injures eyes and lungs; blisters skin	Shell, bomb, landmine, spray tank
5	Nerve agent -----	GB	Scarcely detectable -----	Causes blurred vision with pinpointing of pupils, difficult breathing, salivation, mental confusion, convulsion.	Shell, bomb, rocket
6	Nerve agent -----	VX	Odorless -----	Similar to effects from GB -----	Shell, bomb, landmine, rocket, spray tank
7	Cyanogen chloride (blood agent)	CK	Like peach kernels; irritating.	Injures lungs; causes convulsion, paralysis, coma.	Shell, bomb
8	Phosgene (choking agent) -----	CG	Like new mown hay or green corn.	Injures lungs, causing accumulation of fluid.	Shell, bomb
	<i>Riot Control Agents</i>				
9	Chloroacetophenone -----	CN	Fragrant -----	Causes tears and irritates skin -----	Grenade
10	Micropulverized CN -----	CN 1	Fragrant -----	Causes tears and irritates skin -----	Grenade, mechanical disperser
11	CN solution -----	CNB	Like benzene -----	Causes tears and irritates skin -----	Spray tank
12	CN solution -----	CNC	Like chloroform -----	Causes tears and irritates skin -----	Spray tank
13	O-Chlorobenzalmalonitrile.	CS	Like pepper -----	Causes tears and vomiting; irritates skin; may cause temporary pain in chest.	Grenade
14	Micropulverized CS -----	CS1	Like pepper -----	Causes tears and vomiting; irritates skin; may cause temporary pain in chest.	Grenade, mechanical disperser
15	Adamsite ¹ -----	DM	Odorless -----	Headache, vomiting, violent sneezing, temporary mental depression.	Grenade
16	Micropulverized DM ¹ -----	DM1	Odorless -----	Headache, vomiting, violent sneezing, temporary mental depression.	Grenade
17	Incapacitating Agent -----	BZ	-----	Causes temporary physical disability, headache giddiness, drowsiness, and temporary mental aberrations such as disorientation and hallucinations.	Bomb, thermal generator
	<i>Screening Smokes</i>				
18	Hexachlorethane mixture -----	HC	Acrid like camphor -----	30-minute exposure to ordinary field concentration harmless; 1-hour exposure to heavy concentration may irritate nose and throat and cause illness.	Shell, bomb, grenade, smoke pot

19	Titanium tetrachloride -----	FM	Acrid or pungent -----	Smoke slightly irritates nose and throat; spray droplets or liquid injures eyes; liquid burns skin.	Smoke tank
20	Sulfur trioxide solution -----	FS	Acrid -----	Smoke not toxic in ordinary field concentration; high concentration irritates eyes, throat, and chest and may cause illness; liquid is corrosive, burns the skin.	Shell, smoke tank
21	White phosphorus ² -----	WP	Like match head -----	Smoke is harmless; solid particles burn flesh.	Shell, bomb, grenade
22	Plasticized white phosphorus ² ---	PWP	Like match head -----	Smoke is harmless; solid particles burn flesh.	Shell, bomb, grenade
23	Fog oil (grade 2) ³ -----	SGF2	Like petroleum oil -----	Prolonged exposure to smoke can irritate lungs and throat.	Mechanical smoke generator, smoke pot.
<i>Signaling Smokes</i>					
24	Green smoke -----	GS	Acrid -----	Nontoxic in ordinary field concentrations.	Shell, grenade
25	Red smoke -----	RS	Acrid -----	Nontoxic in ordinary field concentrations.	Shell, grenade
26	Violet smoke -----	VS	Acrid -----	Nontoxic in ordinary field concentrations.	Shell, grenade
27	Yellow smoke -----	YS	Acrid -----	Nontoxic in ordinary field concentrations.	Shell, grenade
<i>Incendiary Agents</i>					
28	Incendiary mixture, PT1 ⁴ -----	PT1	Like petroleum -----	Can cause severe burns when ignited	Bomb
29	Incendiary mixture, PTV ⁵ -----	PTV	Like gasoline -----	Can cause severe burns when ignited	Bomb
30	Incendiary oil, IM ⁶ -----	IM	Like gasoline -----	Can cause severe burns when ignited	Bomb
31	Incendiary oil, ISO ⁷ -----	ISO	Like gasoline -----	Can cause severe burns when ignited	Flamethrower
32	Incendiary oil, NP ⁸ -----	NP	Like petroleum oil -----	Can cause severe burns when ignited	Bomb, flamethrower
33	Incendiary oil, NP2 ⁹ -----	NP2	Like petroleum oil -----	Can cause severe burns when ignited	Bomb
34	Incendiary oil, NP3 ¹⁰ -----	NP3	Like kerosene -----	Can cause severe burns when ignited	Fire starter
35	Thermate, TH4 -----	TH4	None -----	Can cause severe burns when ignited	Cryptographic equipment destroyer.
36	Thermate, TH3 -----	TH3	None -----	Can cause severe burns when ignited	Bomb, grenade
37	Thermite, TH1 -----	TH1	None -----	Can cause severe burns when ignited	Cryptographic equipment destroyer.

¹ As DM and DM1 contain arsenic, they should not be used in inclosed spaces.

² Also has antipersonnel and incendiary effects.

³ Quartermaster class III item of issue.

⁴ Mixture of magnesium and petroleum products.

⁵ Mixture of gasoline, synthetic rubber, magnesium, and other products.

⁶ Gasoline thickened with polymer AE and other products.

⁷ Gasoline thickened with thickener, incendiary oil, M4.

⁸ Gasoline thickened with thickener, incendiary oil, M1 (napalm).

⁹ Gasoline thickened with thickener, incendiary oil, M2 (antiagglomerated napalm).

¹⁰ Kerosene thickened with thickener, incendiary oil, M1 (napalm).

c. Characteristics of Chemical Munitions.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Munition	Agent filling		Filled munition weight (lb)	Time for agent to burn or evaporate at point of release ¹ (approx)	Lettering marking	Old color coding system			Current color coding system		
		Symbol	Weight (lb)				Base color	Color of lettering	Number and color of bands	Base color	Color of lettering	Number and color of bands
2	<i>Grenade</i> Grenade, hand and rifle, smoke, WP, M34.	WP	0.94	1.69	1 min -----	WP smoke bursting type.	Gray	Yellow	1 yellow	Lt green	Lt red	1 yellow ^a
3	Grenade, hand, colored smoke M18 ^a .											
4	Green smoke -----	GS	0.73	1.20	1 min -----	GREEN SMOKE	Gray	Yellow	1 yellow	Lt green	Black	None
5	Red smoke -----	RS	0.73	1.20	1 min -----	RED SMOKE	Gray	Yellow	1 yellow	Lt green	Black	None
6	Violet smoke -----	VS	0.72	1.20	1 min -----	VIOLET SMOKE	Gray	Yellow	1 yellow	Lt green	Black	None
7	Yellow smoke -----	YS	0.73	1.20	1 min -----	YELLOW SMOKE	Gray	Yellow	1 yellow	Lt green	Black	None
8	Grenade, hand, incendiary, TH3, AN-M14.	TH3	1.65	2.00	½ to ¾ min.	TH INCEN	Gray	Purple	1 purple	Lt red	Black	None
9	Grenade, hand, riot, CN1, ABC-M25A1.	CN1	0.22	0.47	Immediately--	None	Gray	-----	1 red ^a	-----	-----	-----
10	Grenade, hand, riot, CN1, ABC-M25A2.	CN1	0.22	0.50	Immediately--	CN1 M25A2 RIOT.	Gray	Red	1 red	Gray	Red	1 red
11	Grenade, hand, riot, CN-DM, M6.	CN-DM	0.64	1.06	1 min -----	CN-DM RIOT.	Gray	Red	1 red	Gray	Red	1 red
12	Grenade, hand, riot, CN-DM, M6A1,	CN-DM	0.59	1.25	1 min -----	CN-DM RIOT.	Gray	Red	1 red	Gray	Red	1 red
13	Grenade, hand, riot, CN, M7.	CN	0.64	1.06	1 min -----	CN RIOT	Gray	Red	1 red	Gray	Red	1 red
14	Grenade, hand, riot, CN, M7A1,	CN	0.79	1.16	1 min -----	CN RIOT	Gray	Red	1 red	Gray	Red	1 red
15	Grenade, hand, riot, CS, M7A2.	CS	0.59	1.00	¼ to ½ min.	CS RIOT	Gray	Red	1 red	Gray	Red	1 red
16	Grenade, hand, riot, CS1, ABC-M25A2.	CS1	0.22	0.50	Immediately--	CS1 M25A2 RIOT.	Gray	Red	1 red	Gray	Red	1 red

17	Grenade, hand, riot, DM1, ABC- M25A2.	DM1	0.14	0.50	Immediately--	DM1 M25A2 RIOT.	Gray	Red	1 red	Gray	Red	1 red
18	Grenade, hand, smoke, HC, AN- M8.	HC	1.20	1.60	2 min -----	HC WHITE SMOKE.	Gray	Yellow	1 yellow	Lt green	Black	None
19	Grenade, hand, smoke, WP, M15.	WP	0.95	1.93	1 min -----	WP SMOKE BURSTING TYPE.	Gray	Purple	1 yellow	Lt green	Lt red	1 yellow ^s
20	Grenade, rifle, colored smoke, M22A2.											
21	Green smoke -----	GS	0.40	1.25	$\frac{3}{4}$ min -----	GREEN SMOKE.	Gray	Yellow	1 yellow	Lt green	Black	None
22	Red smoke -----	RS	0.40	1.25	$\frac{3}{4}$ min -----	RED SMOKE.	Gray	Yellow	1 yellow	Lt green	Black	None
23	Yellow smoke -----	YS	0.40	1.25	$\frac{3}{4}$ min -----	YELLOW SMOKE.	Gray	Yellow	1 yellow	Lt green	Black	None
24	Grenade, rifle, colored smoke streamer, M23.											
25	Green smoke -----	GS	0.40	0.94	$\frac{1}{2}$ min -----	GREEN SMOKE.	Gray	Yellow	1 yellow	Lt green	Black	None
26	Red smoke -----	RS	0.40	0.94	$\frac{1}{2}$ min -----	RED SMOKE	Gray	Yellow	1 yellow	Lt green	Black	None
27	Yellow smoke -----	YS	0.40	0.94	$\frac{1}{2}$ min -----	YELLOW SMOKE.	Gray	Yellow	1 yellow	Lt green	Black	None
28	Grenade, rifle, smoke, WP, H19A1.	WP	0.53	1.57	1 min -----	WP SMOKE BURSTING TYPE	Gray	Yellow	1 yellow	Lt green	Black	None
<i>Incendiaries</i>												
29	Cryptographic equipment destroy- er, incendiary, TH1, M1A1.	TH1	28.00	34.00	1 min -----	(^s)	Gray	Purple	1 purple	Lt red	Black	None
30	Cryptographic equipment destroy- er, incendiary, TH1, M1A2.	TH1	28.00	34.00	1 min -----	(^s)	Gray	Purple	1 purple	Lt red	Black	None
31	Cryptographic equipment destroy- er, incendiary, TH1, M2A1.	TH1	8.50	11.50	1 min -----	(^s)	Gray	Purple	1 purple	Lt red	Black	None

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9	10	11	12
	Munition	Agent filling		Filled munition weight (lb)	Time for agent to burn or evaporate at point of release ¹ (approx)	Lettering marking	Old color coding system			Current color coding system		
1		Symbol	Weight (lb)				Base color	Color of lettering	Number and color of bands	Base color	Color of lettering	Number and color of bands
32	Cryptographic equipment destroyer, incendiary, TH4, M1A2.	TH4	28.00	34.00	1 min -----	(⁵)	Gray	Purple	1 purple	Lt red	Black	None
33	Cryptographic equipment destroyer, incendiary, TH4, M2A1.	TH4	28.00	34.00	1 min -----	(⁵)	Gray	Purple	1 purple	Lt red	Black	None
34	Document destroyer emergency incendiary, M3.	---	95.00	117.00	20 min -----	None	Gray	Purple	1 purple ⁴	Lt red	Black	None
35	File destroyer, incendiary, ABC-M4.	---	72.00	160.00	30 min -----	None	Gray	Purple	1 purple ⁴	Lt red	Black	None
36	Burster, incendiary, field, M4.	---	0.26	2.25	-----	None	Olive drab	Yellow	1 yellow	Lt red	Black	1 yellow ³
	<i>Landmine</i>											
37	Mine, land, chemical, 1-gal HD.	HD	9.90	11.00	3 to 10 days --	HD GAS	Gray	Green	2 green	Gray	Green	2 green
38	Mine, gas, persistent VX, 2 gal, ABC-M3.	VX	10.5	22.75	-----	MINE PERSISTENT VX GAS.	Gray	Green	2 green	Gray	Green	3 green 1 yellow ³
	<i>Smoke Pot</i>											
39	Smoke pot, floating HC, M4A2.	HC	27.50	38.00	10 to 15 min	HC SMOKE	Gray	Yellow	1 yellow	Lt green	Black	None
40	Smoke pot, floating, SGF2, AN-M7A1.	SGF2	13.00	37.00	12 to 17 min	(⁵)	Gray	Yellow	1 yellow	Lt green	Black	None
41	Smoke pot, floating, SGF2, AN-M7.	SGF2	13.00	40.00	12 to 17 min	(⁵)	Gray	Yellow	1 yellow	Lt green	Black	None
42	Smoke pot, HC M1	HC	10.25	12.50	5 to 8 min	HC SMOKE	Gray	Yellow	1 yellow	Lt green	Black	None
43	Smoke pot, HC 30-lb, ABC-M5.	HC	21.00	33.00	12 to 22 min	HC SMOKE	Gray	Yellow	1 yellow	Lt green	Black	None
	<i>Fire Starter</i>											
44	Starter, fire, NP3, M2.	NP3	0.01	0.03	4 min -----	(⁶)	Gray	Purple	None ⁷	Lt red	Black	None

45	Starter, fire, NP3 M1.	NP3	0.05	0.16	13 min -----	None	Gray	Purple	None ⁸	Lt red	Black	None
	<i>Rocket</i>											
46	Rocket, gas non-persistent GB, 115-mm, M55.	GB	10.75	55.00	-----	GB GAS	Gray	Green	1 green	Gray	Green	3 green, 1 yellow. ²
47	Rocket, gas, persistent VX, 115-mm, M55 ⁹ .	VX	10.20	56.00	-----	VX GAS	Gray	Green	2 green	Gray	Green	3 green 1 yellow. ²
48	Rocket, smoke, WP, 3-5-in, M30 ¹⁰ .	WP	2.23	8.90	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	1 brown ¹¹
	<i>57-mm rifle</i>											
49	Cartridge, 57-mm, smoke, WP, M308A1.	WP	0.37	2.75	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None
	<i>60-mm mortar</i>											
50	Cartridge, 60-mm, smoke, WP, M302.	WP	0.76	3.98	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None
	<i>75-mm rifle</i>											
51	Cartridge, 75-mm, smoke, WP, M311A1.	WP	1.35	23.20	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None
	<i>76-mm gun</i>											
52	Cartridge, 76-mm, smoke, WP, M361.	WP	1.38	23.00	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None
	<i>81-mm mortar</i>											
53	Cartridge, 81-mm smoke, WP, M57A1.	WP	4.06	12.38	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None
54	Cartridge, 81-mm, smoke, WP, M370.	WP	1.60	9.34	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None
	<i>90-mm gun</i>											
55	Cartridge, 90-mm, smoke, WP, M313.	WP	1.97	23.64	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None
56	Cartridge, 90-mm, smoke, WP, M313C.	WP	1.97	23.57	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None

See footnotes at end of table.

1	1	2	3	4	5	6	7	8	9	10	11	12
	Munition	Agent filling		Filled munition weight (lb)	Time for agent to burn or evaporate at point of release ¹ (approx)	Lettering marking	Old color coding system			Current color coding system		
		Symbol	Weight (lb)				Base color	Color of lettering	Number and color of bands	Base color	Color of lettering	Number and color of bands
57	105-mm howitzer Cartridge, 105-mm, smoke WP, M60.	WP	4.06	34.83	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None
58	Cartridge, 105-mm, colored smoke, base ejection, M84.											
59	Green smoke -----	GS	5.12	30.48	1 to 4 min ---	GREEN SMOKE.	Gray	Yellow	1 yellow	Lt green	White	None
60	Red smoke -----	RS	5.32	30.68	1 to 4 min ---	RED SMOKE	Gray	Yellow	1 yellow	Lt green	White	None
61	Yellow smoke -----	YS	4.92	30.29	1 to 4 min ---	YELLOW SMOKE.	Gray	Yellow	1 yellow	Lt green	White	None
62	Cartridge, 105-mm, smoke, HC, base ejection, M84.	HC	7.50	32.86	1 to 4 min ---	HC SMOKE	Gray	Yellow	1 yellow	Lt green	White	None
63	Cartridge, 105-mm, gas, persistent HD, M60.	HD	3.00	43.27	3 to 10 days --	HD GAS	Gray	Green	2 green	Gray	Green	2 green
64	Cartridge, 105-mm gas, nonpersistent GB, M360.	GB	1.63	35.59	-----	GB GAS	Gray	Green	1 green	Gray	Green	3 green
65	4.2-inch mortar Cartridge, 4.2-in, gas, M22.											
66	Nonpersistent CG ----	CG	6.25	23.80	5 to 10 min --	CG GAS	Gray	Green	1 green	Gray	Green	1 green
67	Persistent H -----	H	6.20	23.70	3 to 10 days --	H GAS	Gray	Green	2 green	Gray	Green	2 green
68	Persistent HD -----	HD	6.00	23.50	3 to 10 days --	HD GAS	Gray	Green	2 green	Gray	Green	2 green
69	Persistent HT -----	HT	5.75	23.30	3 to 10 days --	HT GAS	Gray	Green	2 green	Gray	Green	2 green
70	Cartridge, 4.2-in, gas, persistent HD, M2A1.	HD	6.00	23.50	3 to 10 days --	HD GAS	Gray	Green	2 green	Gray	Green	2 green
71	Cartridge, 4.2-in, smoke, WP, M328.	WP	8.14	28.66	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt. red	None
72	Cartridge, 4.2-in, smoke, WP, M328B1.	WP	8.14	28.66	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None

73	120-mm gun Projectile, 120-mm smoke, WP-T, M357.	WP	7.51	50.3	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None
74	155-mm gun Projectile, 155-mm, gas, nonpersistent GB, M122.	GB	6.50	97.78	-----	GB GAS	Gray	Green	1 green	Gray	Green	3 green
75	Projectile, 155-mm, gas, persistent HD, M104.	HD	11.70	94.81	3 to 10 days --	HD GAS	Gray	Green	2 green	Gray	Green	2 green
76	Projectile, 155-mm, smoke, WP, M104.	WP	15.60	98.71	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None
77	155-mm howitzer Projectile, 155-mm, gas, nonpersistent GB, M121.	GB	6.50	101.23	-----	GB GAS	Gray	Green	1 green	Gray	Green	3 green
78	Projectile, 155-mm, gas, nonpersistent GB, M121A1.	GB	6.50	101.23	-----	GB GAS	Gray	Green	1 green	Gray	Green	3 green
79	Projectile, 155-mm, gas, persistent VX, M121A1.	VX	6.50	101.00	-----	VX GAS	Gray	Green	2 green	Gray	Green	2 green
80	Projectile, 155-mm, gas, persistent HD, M110.	HD	9.70	94.00	3 to 10 days --	HD GAS	Gray	Green	1 green	Gray	Green	2 green
81	Projectile, 155-mm, smoke, WP, M110.	WP	14.60	97.50	1 min -----	WP SMOKE	Gray	Yellow	1 yellow	Lt green	Lt red	None
82	Projectile, 155-mm, colored smoke, base ejection, M116B1.											
	Green smoke -----	GS	17.19	86.44	½ to 4 min --	GS	Gray	Yellow	1 yellow	Lt green	White	None
	Red smoke -----	RS	17.19	86.44	½ to 4 min --	RS	Gray	Yellow	1 yellow	Lt green	White	None
	Yellow smoke -----	YS	17.19	86.44	½ to 4 min --	YS	Gray	Yellow	1 yellow	Lt green	White	None
83	Projectile, 155-mm, smoke, HC, base ejection, M116B1.	HC	25.84	94.35	2 min -----	HC SMOKE	Gray	Yellow	1 yellow	Lt green	White	None
84	8-in howitzer Projectile, 8-in, gas, nonpersistent GB, M426.	GB	15.7	200.00	-----	GB GAS	Gray	Green	1 green	Gray	Green	3 green

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Munition	Agent filling		Filled munition weight (lb)	Time for agent to burn or evaporate at point of release ¹ (approx)	Lettering marking	Old color coding system			Current color coding system		
		Symbol	Weight (lb)				Base color	Color of lettering	Number and color of bands	Base color	Color of lettering	Number and color of bands
85	Projectile, 8-in, gas, persistent VX, M426.	VS	14.1	200.00	-----	VX GAS	Gray	Green	2 green	Gray	Green	3 green
86	<i>Rocket warhead</i> Warhead, 762-mm rocket, gas, non-persistent GB, M79.	GB	396.00	1600.00	-----	None	Gray	Green	1 green	Gray	Green	3 green 1 yellow. ²

¹ Variable, depending on amount of agent released, terrain, and meteorological conditions.

² Yellow band indicates high explosive charge.

³ Grenade top painted same color as color of smoke filling.

⁴ Color markings on shipping container.

⁵ Lettering consists of nomenclature of munition.

⁶ Lettering consists of instructions for use of munition.

⁷ One end colored purple to identify fire starter as an incendiary; other end which houses ignition device is colored red.

⁸ The base is colored purple to identify fire starter as an incendiary.

⁹ Fired from 115-mm, multiple rocket launcher.

¹⁰ Fired from 3.5-inch rocket launcher.

¹¹ Brown band indicates low explosive charge; marking on rocket motor assembly.

d. Chemical Ammunition Requirements. For data about chemical ammunition requirements, see FM 3-10-series.

e. Chemical One-gallon Landmine Operations (see also para 4-31c).

	1	2	3	4	5	6
1	Nature of task	Squad task	Platoon task	Company task	Average time ¹	
		1 truck (2½-ton) and 6 men	4 squads	12 squads	Time fuze or detonating cord	Wire for electric firing
2	Barrier (100 meters deep).	300 meters, 300 mines.	1,300 meters, 1,300 mines.	5,000 meters, 5,000 mines.	4 hours	8 hours
3	Road contamination	1,600 meters, 330 mines.	6,400 meters, 1,320 mines.	19,200 meters, 3,960 mines.	15 to 20 minutes ²	2 hours

¹ The time should be increased 50 percent for nightwork.

² Detonating cord laid from truck; mines placed on cord.

Section V. SIGNAL COMMUNICATIONS

4-19. General

a. These data are intended for use as general guides only. The highly technical nature of signal operations and varying security measures require that these data be applied only as recommended by the unit Signal officer after modification to local field conditions and in the light of the tactical situation.

b. For Signal troop requirements in a type army, see paragraph 4-2e(12).

c. For Signal troop requirements in airborne operations, see paragraph 4-4; in the theater army logistical command, see paragraph 4-3; and in amphibious operations, see paragraph 4-5.

d. For signal construction factors, see paragraph 8-13.

e. For characteristics of target acquisition and combat surveillance equipment, see FM 101-10-3, paragraph 4-11.

f. Publications Governing Signal Communications.

- (1) Pertinent sections of the unit SOP set forth the general principles under which the unit signal system will operate. Usually the SOP is governed

by the provisions of that of the next higher headquarters and, in turn, serves as a guide for that of subordinate headquarters.

- (2) Standing signal instructions (SSI) are prepared by the unit Signal officer and published by the command to provide permanent direction for the use of technical items of signal operation instructions (SOI).
- (3) SOI contain the specific technical directions for the operation of the various means of signal communication. They include separate items providing such information as telephone directory code names and numbers, radio call signs and frequencies, unit code and ciphers, and pyrotechnic signals. Because changes in items of SOI occur frequently, paragraph 5 of the field order specifies the current index.
- (4) Joint Army-Navy-Air Force Publications (JANAP) and Allied Communications Publications (ACP) contain joint and combined instructions, methods, and procedures pertaining to communication planning and operations.

4-20. Users Served by the Signal Communication System

The military signal communication system in a theater of operations provides service for the following:

a. Signal Communications in the Combat Zone.

- (1) Division.
- (2) Corps.
- (3) Field army.
- (4) Army group.

b. Signal Communications in the Communications Zone.

- (1) Theater Army Logistical Command.
- (2) Base Logistical Command.
- (3) Advance Logistical Command.
- (4) Area Commands.
- (5) Terminal Commands.
- (6) Depots.
- (7) Intersectional Services.
- (8) Other Command Headquarters (Theater, TACAC, TAADC, Theater Army, etc.).

c. Communication Facilities as Required for—

- (1) Air defense.
- (2) Coordination of Army and Air Force activities, including facilities for the request of air support.
- (3) Coordination of Army and Navy activities.
- (4) Military Police activities, including traffic control.
- (5) Personnel replacement systems.
- (6) Intelligence and counterintelligence activities.
- (7) Civil affairs.
- (8) Psychological warfare activities.
- (9) Press, public relations, and special services activities.
- (10) Guided missile installations and activities.
- (11) Clandestine and guerrilla warfare.
- (12) Interallied signal communication.
- (13) Electronic warfare.
- (14) Meteorological service.
- (15) Signal security activities.
- (16) Air traffic control.
- (17) Air navigation systems.

- (18) Identification, friend or foe, systems.
- (19) Automatic data processing systems.
- (20) Military highway communications.
- (21) POL supply.

4-21. Command Posts and the Area-Type Signal Communication System

a. The Area-Type Signal Communication System. The area-type signal communication system, with its multi-axes configuration, provides the field army, corps, and division units with signal center installations through which they can establish a call to any point in the field army area. The system is supplied primarily by six combat area signal battalions (army) at field army level and by the signal battalion associated with each division. Essentially, the system is composed of radio-relay links for long lines of communication, the standard wire installations for internal command post communications, and local wire installations to connect subordinate and supporting units to the signal center. The area-type system divides the geographical area of a command into smaller areas (not necessarily equal in size) or relatively equal communication load. Communication facilities are supplied at each signal center installation to enable the movement of command posts from one location to another without disruption of the overall system. The signal center installation provides the maximum number of alternate routes for message handling to reduce probability of interruption of communications between major units. Initial long-line connections between major headquarters at all levels will be radio relay; as the situation and equipment availability permit, these circuits may be replaced by a more secure wire system.

b. Command Posts. Each major headquarters installation at field army, corps, and division level is furnished sufficient signal personnel and equipment to install, operate, and maintain a complete command post communication system. The time required to install the system will vary with the situation and size of the headquarters. Command and staff signal communication facilities will, in most cases be immediately available in the alternate signal

center installations previously installed to provide the initial area-type signal communication system.

c. Movement. Military operations on the nuclear battlefield will require frequent command post displacements. The facilities required to provide signal communications to the command should be responsive to the command; i.e., they must have a high degree of flexibility. This is accomplished through the multiaxes configuration used in the signal communication system. Because movement causes a temporary partial reduction of the overall signal communication system, movement of major headquarters should be as infrequent as the situation will permit. When it is necessary for the commander to establish a headquarters close to the front in a rapidly moving situation, facilities as required are made available to provide the necessary communications for the commander's group.

4-22. Communication Center

a. Function. The function of the communication center is to transmit, receive, and deliver messages by the most reliable means. The figures in this paragraph and in paragraph 4-24 apply to communication center operations and are based on World War II experience. Under present and future concepts of operations the accuracy of these figures may vary widely.

b. Cryptographic Operations. Computed from afteraction reports of selected units in the ETO during World War II, and including messages sent by radio, teletypewriter, and miscellaneous means.

1		Division	Corps	Field army	Army groups
2	Average code groups per month---	225,000	500,000	750,000	1,800,000

c. Precedence. The nomenclature for classes of precedence in the following table, compiled from afteraction reports in the ETO during World War II, has been changed to conform to present usage.

	Flash	Immediate	Priority	Routine
Percentage of all messages (field army headquarters) --	2%	36%	23%	39%

d. Speed of Transmission.¹

Method of transmission	Approximate transmission rate (words per minute) ²
<i>Panels</i> (15 code groups per hour) -----	0.25
<i>CW Manual Telegraph</i> (wire or radio, one-way) ³ :	
Average operator (hand printed) ---	12-15
Skilled operator (typewritten) -----	25-40
<i>Teletypewriter</i> (wire or radio, one-way):	
Average operator (keyboard operation).	25-40
Tape operation (on one telegraph circuit).	60 or 100
Tape operation (on one voice circuit, 16 tape circuits).	960 or 1,600
<i>Facsimile</i> (wire or radio, one-way, weather map size copy or two 8 x 10½ pages in 20 minutes) ³ :	
Average text per page (400 words) ---	40
Completely filled page, no margins or blank space (1000 words).	100
<i>EAM Data Cards</i> (wire or radio, one-way, fully punched, 80 columns or 13 words per card):	
On a 60 word-per-minute telegraph circuit.	39
On a 100 word-per-minute telegraph circuit.	65
On a 3 kilocycle voice circuit (11 cards/min).	143
Maximum on voice circuit (4 x 11 cards/min).	572
<i>Fielddata Messages</i> (wire or radio, one-way, 8 bits per character):	
Paper tape on telegraph circuit -----	60 or 100
Paper tape on a 3 kilocycle voice circuit.	to 600
Magnetic tape on average voice circuit.	to 1,500
Magnetic tape on special voice circuit.	to 3,000
Magnetic tape on 48-kilocycle 12-voice-channel group.	to 24,000
Magnetic tape on 1 megacycle video circuit.	to 500,000

See footnotes at end of table.

Method of transmission	Approximate transmission rate (words per minute) ²
Telephone (or voice on wire or radio, one-way):	
Push-to-talk operation (radiotelephone).	80-120
Average talker -----	100-150
Fast talker reading clear text -----	150-250
Enciphered code groups using phonetic alphabet.	15-20

¹ If times for message preparation, approval, pickup, logging, coding, tape punching, and other processing functions are added at both ends of a circuit, the overall transmission speeds will be much lower in many cases than those given in this table.

² One word equals 5 characters plus a space.

³ Simplex, half-duplex, one-way-at-a-time, or one-way automatic-reversible operation speeds are the same as for one-way. The total operation speed for both directions of full-duplex operation is equal to twice that of one-way operation.

4-23. Means of Signal Communication

a. General.

(1) Military messages are transmitted by

- (a) Messenger, including scheduled and special foot, motor, and airplane messengers and officer couriers.
- (b) Wire circuits, including telephone, teletypewriter, and facsimile.
- (c) Visual, including flags, panels, lamps, and pyrotechnics.
- (d) Sound, including whistles, horns, loudspeaker systems, and small arms fire.

1		Armored division	Infantry division	Corps	Field army	Army group
2	Average messages per month -----	2,400	200	500	9,500	3,800
3	Average code groups or words per month -----	-----	35,000	85,000	163,000	650,000

c. Television. Military television is currently limited to noncombat applications in CONUS and the communications zone; e.g., training, conferences, etc.

d. Wire.

- (1) **General.** Wire communication networks generally provide a more secure means of electrical transmission of messages than does radio. Relative

(e) Radio circuits, including teletypewriter, voice, CW, facsimile, and data and special transmissions.

(f) Ancillary devices, such as data processing and transmission facilities and special communication devices.

- (2) **Use of means of signal communication.** Messenger, wire, radio, and radio relay are used for communication within and between division, corps field army, and higher headquarters. In addition to these means, visual and sound systems are used in air-ground signaling, in amphibious operations, for emergency communication within small units, and as warning signals.

b. Radio.

- (1) **General.** The amount of traffic that is handled by radio—exclusive of messages handled via radio-relay equipment installed as part or in lieu of the wire net—depends on the type of unit and the rate of movement. In general, radio forms a standby means of communication during static conditions when its operation would provide information to enemy intercept and analysis; but in fast-moving situations when it is difficult to extend wire lines rapidly enough and when units disperse on wide front, radio becomes a major means of communication.
- (2) **Radio traffic of selected units in the ETO during World War II.**

security depends on geographic location of the net, the tactical situation, local security measures, the type of equipment being used, and the type of conductor employed in the line. The transmission of classified messages in the clear over these circuits will be resorted to only when the urgency of the tactical situation outweighs the security requirements.

- (2) *Telephone.* Each headquarters has enough telephone facilities to satisfy normal operating requirements, providing that proper use is made of written messages for traffic not adapted to telephonic transmission. During World War II, unit switchboards in the ETO handled the following average of calls:

1		Division	Corps	Field army	Army group
2	Calls per day--	2,000	5,000	12,500	18,000

- (3) *Teletypewriter.* The following table shows the average number of teletypewriter messages handled by various types of headquarters in the ETO during World War II.

1		Division	Corps	Field army	Army group
2	Messages per month--	750	4,000	11,500	28,000

- (4) *Construction.* For figures on permanent and semipermanent wire construction, see paragraph 8-13.

(a) *Rates of wire line construction.*

1		Foot troops	Reel trucks	Signal construction battalion
2	Field wire----	1½ MPH/ 3-man team.	3-5 MPH/ 6-man team.	-----
3	Spiral-4 cable (on existing support).	-----	1 MPH/ 8-man team.	-----
4	Open wire (10-wire pole line).	-----	-----	30 miles per week.

- (b) *Spiral-4 cable, field wire, and open wire laid to next subordinate headquarters by selected units during World War II in the ETO.*

1	Miles per month of--	Division	Corps	Field army
2	Field Wire -----	450	-----	-----
3	Cable and field wire -----	-----	700	1,300
4	Open wire -----	-----	-----	500

- (c) *Average rate of repair of wire lines over a 6-month period during World War II in the ETO by a well-trained division signal company.*

1		Day-light	Night	Average time out day and night
2	Elapsed time in minutes--	70	120	95

e. *Comparison Between Radio-Relay and Wire Circuit Installation Time*¹ (fig. 4-22).

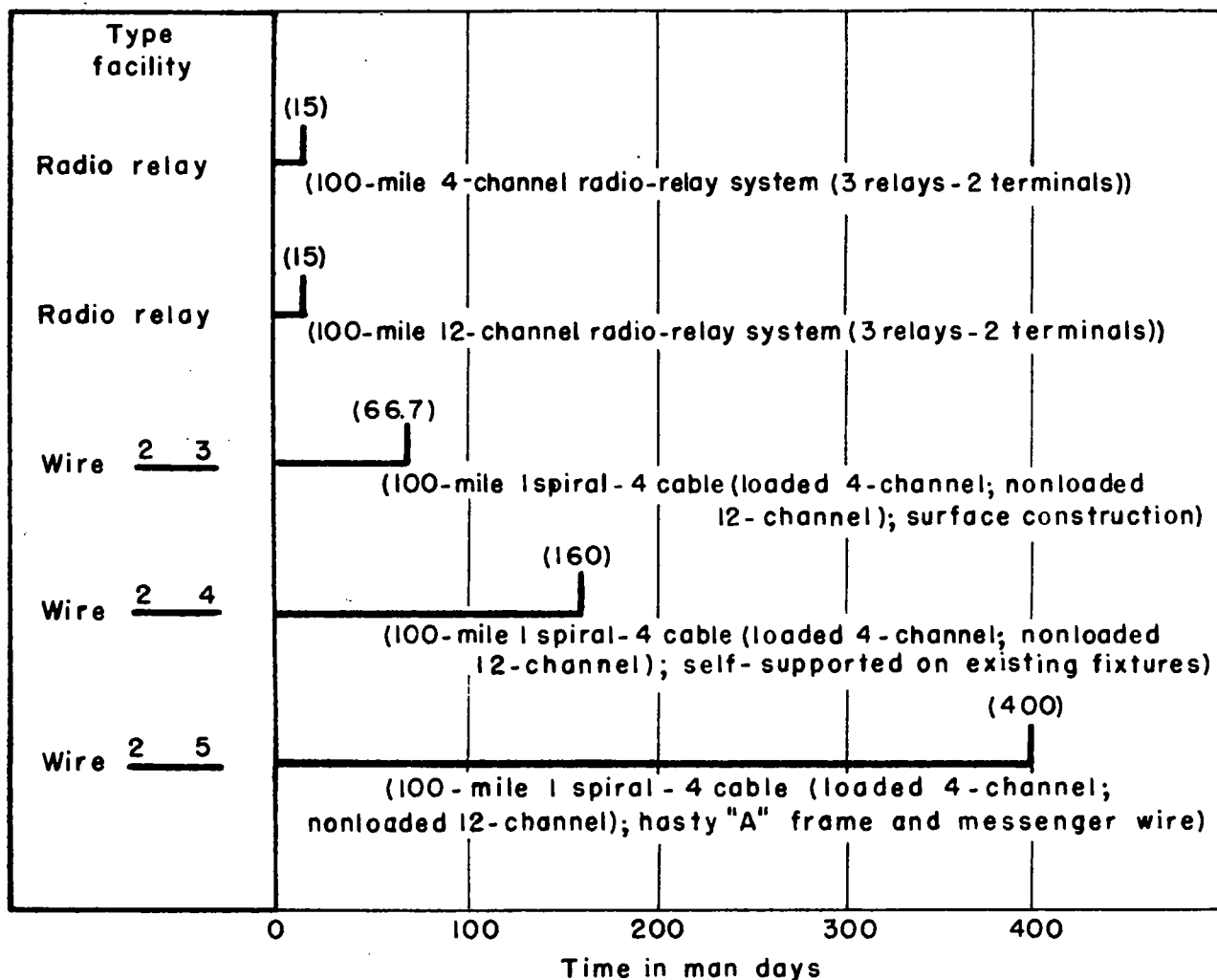
f. *Messenger.*

- (1) The rate of travel of various types of messenger is listed below, no consideration being given to traffic restrictions, climate, or weather.

1	Kind of messenger	Rate of travel in miles/kilometers per hour	
		Day	Night
2	Dismounted (runner).	3-5/4.82-8.04	2-4/3.21-6.43
3	Motor -----	25-50/40.23-64.37	15-30/24.14-48.89
Aircraft:			
4	Fixed-wing --	90-160/144.84-257.49	90-160/144.84-257.49
5	Rotary-wing --	60-100/96.56-160.93	60-100/96.56-160.93

- (2) Each headquarters is furnished organic messenger facilities. The bulk of messenger traffic is carried by motor messenger. The capabilities of motor messenger service available to units are indicated below.

1		Division	Corps	Field army
2	Miles/kilometers of route per month -----	7,000/11,265	30,000/48,280	90,000/144,841
3	Pouches and messages -----	17,000	50,000	150,000



¹ Time includes site survey and selection, travel time, equipment and antenna installation, assuming that all sites are accessible to vehicle.

² Combat conditions: 12 hour day, figuring loss loading, travel, supply, and vehicle maintenance.

³ Based on sustained capability of 12 miles per 8-man team per day.

⁴ Based on sustained capability of 5 miles per 8-man team per day.

⁵ Based on sustained capability of 2 miles per 8-man team per day.

Figure 4-22. Time in man-days.

- (3) The quantity of messages that can be transmitted by messenger and the speed of transmission are increased when messages are accounted for in the communication center by pouch rather than by individual message.

4-24. Special Communication Requirements

a. General. Certain intersectional services require special communication facilities. When-

ever possible, these requirements are integrated into the theater army signal communication system. Special requirements of these services are presented in *b* through *e* below.

b. Military Railway Service Communication Data. A military railway service (MRS) communication system normally consists of open wire facilities. As an *ultimate* overseas necessity, VHF radio and VHF/UHF radio relay are required.

- (1) Two metallic pairs are required to provide the telephone and teletypewriter circuits needed. Open wire leads may or may not closely follow the railway, but circuits must be available at each way station and dispatcher's office.
- (2) Associated equipment with open wire lines usually consists of telephone dispatching equipment, simplex and composite sets, telephone and telegraph voice frequency repeaters, and may include use of telephone carrier facilities.
- (3) VHF radio may be used in railroad yard areas for yard-to-engine operation.
- (4) VHF/UHF radio relay may be used between adjacent division dispatcher's offices and from division dispatcher to way stations where wire lines experience frequent outages because of hostile action and where backup communications are required. It is valuable also during operations requiring speed of installation.
- (5) Circuit requirements—
 - (a) Dispatcher to way stations.
 - (b) Way station to way station.
 - (c) Dispatcher to dispatcher.
 1. Telephone.
 2. Teletypewriter.
 - (d) Division headquarters to MRS headquarters.
 1. Telephone.
 2. Teletypewriter.

c. Military Pipeline Communication Data.

- (1) Military pipeline communication may be provided on allocated channels of the theater army signal communication system. In geographical areas where it is not feasible to utilize this system, a separate radio-relay system will be installed and, when practicable, it will be integrated with the theater army signal communication system.
- (2) VHF radio facilities are provided at each pumping station, tank farm complex, and district dispatcher's

office for communication to aerial and ground mobile units. This equipment further provides emergency communication between these elements.

- (3) High frequency radio facilities are provided for emergency communication between the chief dispatching station and each district dispatcher.
- (4) Equipment associated with the system consists of telephone dispatching systems, teletypewriter sets, simplex and composite sets, telephone and telegraph voice frequency repeaters, and may include telephone carrier systems.
- (5) For planning purposes, it is estimated that approximately 65 percent of the total pipeline communication circuit requirements in an overseas theater will be provided from the theater army signal communication system. This estimate is based on the assumption that the pipelines and the axes of the theater army signal communication system will generally coincide. The remaining 35 percent by the pipeline communication circuit requirements will be provided by the Signal Corps as separate construction to support the POL system.

d. Military Highway Communication Data.

- (1) A military highway communication system usually consists of fixed VHF radio stations, with the stations located at strategic intervals of approximately 40 or 50 miles. These stations may be situated adjacent to the traffic control posts (TCP) and highway regulating points or may be situated at the same location. The fixed radio stations are connected to the nearest theater army signal switching center in order to provide access to the integrated theater army communication system. This connection also enables the strategically located highway radio stations, TCP's and highway regulating points to communicate with each other and also to communicate with ports, depots, headquarters, and other areas.

- (2) The fixed VHF radio stations enable the radio-equipped vehicles, normally military police and some transportation or ordnance vehicles, to communicate with the nearest TCP and highway regulating point while moving or stopped. All such radio contact depends on the terrain, location of fixed and vehicular radio sets, and other factors affecting radio transmission.
- (3) In addition to radiotelephone communication between fixed and vehicular radio stations, telephone and teletypewriter circuits are provided via the open wire or radio-relay facilities between the fixed radio stations serving the TCP's and the highway regulating points.
- (4) The fixed radio stations are operated by the Signal Corps in order to provide maximum economy of equipment, radio frequencies, speed of service, and efficiency to the various services and units requiring communications along the military highway system. At each fixed radio station, a small switchboard, when required, is also operated by the Signal Corps, with local telephone connections to the various adjacent services operating the TCP's and the highway regulating points. In some instances, the fixed radio station will be located at or near a theater army signal switching center or a local signal center and will use its switchboard facilities.

e. Air Defense Communications Data.

- (1) Air defense (AD) tactical success hinges to a large degree on a reliable communications system. Precise track information on airborne targets as well as command and control data must be rapidly and accurately exchanged if air defense is to accomplish its assigned tasks.
- (2) Air defense units in a theater of operation will normally be linked together with an electronic fire distribution system (Missile Monitor). The

use of this fire distribution system (FDS) demands the instantaneous exchange of automatic data link (ADL) and voice information between various echelons of the air defense command.

- (3) As presently established, the Army Area Communication System (AACS) does not possess the capability of providing air defense units with a sufficient number of circuits to satisfy their needs. Future proposed increases in the traffic handling capability of the AACS may make its use by air defense feasible.
- (4) A VHF/UHF radio relay system is established by Signal Corps detachments that are supplied to air defense units by attaching the appropriate personnel from TOE 11-500D (see para. 4-2e(12)) to the air defense organization. The equipment utilized is basically the same as that used to establish the AACS and provides generally the same capabilities. VHF/UHF radio relay facilities are established at each air defense unit, utilizing the Missile Monitor fire distribution system and provide the following channels:
 - (a) ADL.
 - (b) Command (Hot Loop).
 - (c) Intelligence and radar reporting.
 - (d) Administrative and maintenance.
- (5) If an electronic fire distribution system is not utilized, the necessary data is exchanged over communications nets established by radios organic to the AD units. If FDS equipment is available, the TOE radios provide a backup means of communication.

4-25. Signal Pictorial Services

a. General. Still and motion picture ground photography, aerial still photography, and still picture laboratory processing services are utilized at division, corps, and field army levels. Film and equipment and television services are provided by units from theater army. Facilities to provide these various services are available

in differing degrees, commensurate with the pictorial requirements at these levels of command. The pictorial facilities at division are used almost exclusively for tactical purposes, while at corps and above they are used more extensively for historical record, administrative

purposes, training, and information. However, each level of command is responsible for the provision of pictorial support to its subordinate units; when such support is for tactical purposes, requests from subordinate units are given priority consideration.

b. Pictorial Capabilities. The following chart shows the pictorial facilities of the field army.

1	2	3	4	5	6	7	8
Unit	Pictorial personnel	Ground cameras	Aerial cameras (aircraft)	Aerial cameras (drone)	Motion picture cameras	Still photo lab	Motion picture lab
Signal Support Operations Co, Signal Bn, Armored, Infantry, & Mechanized Div, TOE 11-39E.....	OFF 1 EM 9	X	-----	-----	X	X	Service from theater.
Aviation General Support Co, Aviation Bn, Armored, Infantry, & Mechanized Div, TOE 1-78E.....	OFF 1 1 EM 17 1	-----	X	X	-----	X	-----
Hq & Hq Co, Signal Bn, Airborne Div, TOE 11-216E.....	EM 8	X	-----	-----	X	X	Service from theater.
Aviation General Support Co, Aviation Bn, Airborne Div TOE 158E 2	OFF 1 1 EM 17 1	-----	X	X	-----	X	-----
Aerial Surveillance Co, TOE 1-128E.....	-----	-----	X	-----	-----	X	-----
Hq & Hq Co, Signal Bn, Air Assault Div, TOE 11-106T 3	EM 10	X	-----	-----	X	X	Service from theater.
Aerial Surveillance Co, Aerial Surveillance & Attack Bn, Air Assault Div, TOE 1-147 3	EM 7	-----	X	-----	-----	X	-----
Armored Cavalry Regiment Aviation Co TOE 1-67D.....	OFF 1 EM 14	-----	X	X	-----	X	-----
Hq & Hq Co, Corps Signal Bn TOE 11-16E 2	OFF 1 EM 19	X	-----	-----	X	X	Service from theater.
Corps Aviation Co TOE 1-127D.....	-----	-----	X	-----	-----	Service from corps sig bn.	-----
Hq & Hq Co, Army Signal Bn TOE 11-96D.....	OFF 4 EM 40	X	-----	-----	X	X	Service from theater.
Army Aviation Co TOE 1-137D.....	-----	-----	X	-----	-----	Service from army.	-----

See footnotes at end of table.

1	2	3	4	5	6	7	8
Unit	Pictorial personnel	Ground cameras	Aerial cameras (aircraft)	Aerial cameras (drone)	Motion picture cameras	Still photo lab	Motion picture lab
Hq & Hq Co, Military Intelligence Bn, Air Reconnaissance Support, Field Army TOE 30-6D-----	OFF 1 EM 8	These units have special laboratory equipment for Army reproduction of Air Force aerial photographs.					
Military Intelligence Det, Air Reconnaissance Support, Field Army TOE 30-7D-----	OFF 1 EM 8						

¹ Includes personnel in drone section.

² Draft TOE.

³ Tentative TOE.

4-26. Characteristics of Communications-Electronics Equipment

The nomenclature, description, range, and

appropriate remarks for each category of COMMEL equipment are published in section III, FM 24-19.

Section VI. FIELD ENGINEERING

4-27. General

These data are intended for use as general guides only. Their application should be varied to conform to local field conditions as required in each specific tactical situation, based on the recommendation, after reconnaissance, of the unit engineer charged with the task.

4-28. Roads and Bridges

a. Load Capacity of Civilian Bridges. Peacetime design includes high safety factors for unusual loads and deterioration. As a guide for military operations, it may be assumed that the ordinary civilian bridge in good condition will carry twice the rated civilian capacity when restrictions are placed on the speed and spacing of vehicles and on the number of lanes in use. However, it is advisable to have bridge capacity analyzed by an engineer officer.

b. Road Capacity. The capacity of a road is limited usually by the capacity of the bridges thereon.

c. Marking Bridges and Vehicles.

- (1) Bridges are marked with two types of signs: circular and rectangular. Circular signs, by means of symbols

and numerals, indicate the one-way capacity classification of a bridge, wheeled or tracked class or both, as well as the capacity classes of a two-lane bridge when used as either a double- or single-lane bridge. The capacity of two-way bridges is marked by vertical arrows under two respective one-way and two-way class numbers. When dual classification of bridges is to be posted, the wheeled and tracked classes are denoted by silhouette-type symbols together with the appropriate class numbers. When desired, rectangular signs located beneath the bridge class signs indicate any other information concerning the bridge, such as height or width limitations. Any bridge class which is a fraction of a whole number is *reduced* to the next *lower* whole number; *for example*, 22.7 would be reduced to 22.

- (2) Vehicles are marked with class numbers which represent the effect a vehicle will have on the bridge when crossing it; the effect is determined

from the gross weight of the vehicle and the weight distribution. Classification numbers are assigned to all single vehicles in military use which have a gross weight exceeding 3 tons, and to all trailers in military use which have a rated payload exceeding 1½ tons. All *single* vehicles in excess of 3 tons gross weight carry front class signs only; a side vehicle classification sign is placed on the right side of classified *towing vehicles and trailers* exceeding 1½ tons. For *combination* vehicles, each leading vehicle in the combination carries a front vehicle's classification sign. It is inscribed with the classification number of the combination with the letter C in red above the classification number. In addition, each vehicle in the combination carries a side vehicle classification sign inscribed with its classification, as a single vehicle. In the case of towed vehicles, when the vehicles are less than 30 yards apart and both are on one bridge span at the same time they are classed as combination vehicles. In these cases,

the classification of the combination is the sum of the classification numbers of the separate vehicles. This combination classification number is shown on a temporary front sign. Special-purpose vehicles are equipped with front classification signs or side classification signs, depending on their means of propulsion. For more detailed information, see FM 5-36.

d. Engineer Road Construction. The net effective man-hours required for personnel of the engineer battalion to clear, grub, strip, and rough grade 1 mile of combat road, pioneer type, are as follows:

Man-hours ¹			
	1	2	3
1	Terrain	14 feet/4.2 m one-way	24 feet/7.3 m two-way
2	Flat—prairie ----	1,500	2,200
3	Rolling -----	2,000	2,800
4	Hilly—forested --	2,500	3,300

¹ Not included are requirements for the following tasks:

- a. Graveling and culvert construction. See paragraph 8-5b.
- b. Bridge construction. See paragraphs 4-30 and 8-5b.
- c. Road rehabilitation. See paragraph 8-5c.

4-29. River and Gap-Crossing Equipment.

a. Distribution of Class II Equipment.

	1	2		3		4	5	6
1	Item	Inf Div Engr Bn TOE 5-155E ¹		Armd & Mech Div Engr Bn TOE 5-145 ¹		Airborne Div Engr Bn TOE 5-25E	Engr Flt Bn Co TOE 5-78E	Engr PNLBRG Co TOE 5-77E
		MAB	Conventional	MAB	Conventional			
2	Boat, bridge erection, inboard engine, aluminum, gas-driven, 27 ft long.....		8		8		10	
3	Boat, landing, inflatable, assault craft, nylon cloth, 15-man.....	18	18	18	18	20	70	
4	Boat, reconnaissance, pneumatic, 3-man.....	28	28	32	32	15	10	
5	Bridge, armored vehicle launched, scissoring-type, class 60, aluminum, 60-ft length of span.....	6	6	6	6			
6	Bridge, fixed, highway, aluminum, 38-ft length of span.....					2		
7	Bridge, fixed, highway, pony truss, portable, panel-widened roadway, Bailey type.....							1
8	Bridge, floating, foot, aluminum, 472 ft 6 in.....					1	1	

See footnotes at end of table.

1	Item	2		3		4	5	6
		Inf Div Engr Bn TOE 5-155E ¹		Armd & Mech Div Engr Bn TOE 5-145 ¹		Airborne Div Engr Bn TOE 5-25E	Engr Float Brg Co TOE 5-78E	Engr PNLBRG Co TOE 5-77E
		MAB	Conven- tional	MAB	Conven- tional			
9	Bridge, floating, highway, aluminum deck, balk superstructure, on pneumatic floats, M4T6, 141 ft 8 in.		² 4		² 4		5	
10	Bridge, floating, raft section, light tactical.	2	2	2	2	2	6	
11	Bridge erection set, fixed bridge, highway, pony truss, portable, panel-widened roadway, Bailey type.							1
12	Bridge erection set, floating bridge, CL 60 w/stl superstructure or w/aluminum deck, balk superstructure.		4		4		5	
13	Ferry conversion set, raft, infantry support.	2	2	2	2		6	
14	Launcher, M48 tank chassis, transporting for 40- and 60-ft bridge, armored vehicle launched, scissoring-type, class 60.	4	4	4	4			
15	Outboard motor, gas, 25 BHP.	8	8	8	8	10	24	
16	Bridge floating highway class 60, 135 ft lg.		² 4		² 4			
17	Bridge floating mobile assault amphib 36 ft 1 in. lg, 10 ft W, 10 ft 4 in. H.	16		16				
18	Ramp load vehicle mobile assault amphib float bridge 39 ft 4 in. lg, 10 ft W, 11 ft 8 in. H.	8		8				

¹ Equipment issued from either mobile assault bridge (MAB) or conventional equipment column, exclusively.

² When conventional bridging is issued unit is authorized either the M4T6 equipment, line 9 or the class 60 bridge, line 16.

b. Characteristics of Assault Boats.

1	1	2	3		4	5	6	7	8
	Type of assault boat	Type of propulsion	Maximum steam velocity (FPS)		No data available	Rated capacity (short tons)	Engineer crew	Typical loads	Total load in short tons ¹ (including crew)
			Make headway	Safely navigate					
2	M2.	Paddles	4			2.00	3	Rifle squad plus 2 men. Rifle squad minus fire team plus ½ weapons squad (5 men).	1.65
3	Plastic, 16-ft.	Paddles	4	5		1.69	3	W 3,000 rd cal .30 and 7 rd 3.5 ammunition.	1.73
		25 HP outboard	8	9		1.64	2	Rifle squad plus 2 men. Rifle squad minus fire team plus ½ weapons squad (5 men).	1.65
4	Pneumatic (15-man).	Paddles	5	8		1.70	3	81-mm mortar squad (minus driver) W 48 rd plus 4 men.	1.56
		25 HP outboard	8	12		1.65	2	81-mm mortar squad (minus driver) W 48 rd plus 5 men.	1.56

See footnotes at end of table.

	1	2	3	4	5	6	7	8
1	Type of assault boat	Type of propulsion	Maximum steam velocity (FPS)		Rated capacity (short tons)	Engineer crew	Typical loads	Total load in short tons ¹ (including crew)
			Make headway	Safely navigate				
5	Ponton, M2.	25 HP outboard	7	No data available	3.95	2	2 rifle squads and 1 fire team.	3.19
							1 rifle squad and 1 weapons squad W 6,000 rd cal .30 and 14 rd 3.5 ammunition.	3.02
							2 rifle squads.	2.64
			9		2.70		Rifle squad and 1/2 weapons squad W 3,000 rd cal .30 and 7 rd 3.5 ammunition plus 4 men.	2.61

¹ Load figures are based on the following:

Rifleman, with individual equipment	220 lb
Machinegun, cal .80	49 lb
Launcher, 3.5-in rocket	13 lb
Mortar, 81-mm, M29	115 lb
Cal .80 ammunition, 1,000 rd	85 lb
Launcher, 3.5-in rocket, ammunition, 1 rd	9 lb
Mortar, 81-mm, ammunition, 1 rd	12 lb

c. Characteristics of Rafts.

[Located in back of manual]

d. Characteristics of Standard Floating Bridges.

[Located in back of manual]

e. Characteristics of Fixed Bridges Which May Be Constructed From Floating Bridge Components (fig. 4-23).

f. Characteristics of Fixed Highway Bridges.¹ (fig. 4-24).

[Located in back of manual]

g. Characteristics of Railway Bridge Equipment (fig. 4-25).

[Located in back of manual]

1	2	3	4	5	6	7	8	9
Type of bridge	Spans	Crossing capacities ¹			Maximum utilization of one bridge set ²			
					Number of single spans	Length of multi-span with trestles		
		Normal	Cautious	Risk		Ground braced ³	Fully braced ⁴	Pier ⁵
2	Class 60 (Standard B)	24'	120 100	120 100	120 100	20		96'
		26'	120 95	120 100	120 100	20		104'
		28'	115 80	120 87	120 100	20		112'
		30'	105 65	110 75	120 90	13	165'	120'
		32'	95 60	105 70	120 85	13	173'	128'
		34'	85 55	90 63	110 75	13	181'	136'
		36'	75 50	81 58	100 68	13	189'	144'
		38'	65 45	75 53	90 65	13	197'	152'
		40'	60 40	68 50	83 60	13	205'	160'
		50'	30 30	36 36	50 45	10	350'	245'
		60'	20 22	22 25	28 30	8	420'	
3	M4 ⁶ (Standard B)	15'	120 100	120 100	120 100	12	195'	195'
		21' 8"	120 100	120 100	120 100	4		85' 8"
		23' 4"	120	120	120	2		46' 8"
		30'	80 60	100 80	110 90	4	165'	120'
		38' 4"	45 35	70 55	80 60	2	91' 8"	76' 8"
		45'	23 25	45 40	54 45	3	135'	162'
4	M4T6 ⁶	15'	120 100	120 100	120 100	10		30'
		21' 8"	120 100	120 100	120 100	1.8		
		23' 4"	120 100	120 100	120 100	3		46' 8"
		30'	80 60	100 80	110 90	3.6	75'	60'
		38' 4"	45 35	70 55	80 60	3	91' 8"	76' 8"
		45'	23 25	45 40	55 45	3.4	135'	105'
5	Bridge, fixed, aluminum, hwy-type, 38-ft spans ⁶	15'	120 100	120 100	120 100	2	NA	
		21' 8"	120 100	120 100	120 100	1.5		
		23' 4"	120 100	120 100	120 100	1		
		30'	80 60	100 80	110 90	1		
		38' 4"	45 35	70 55	80 60	1		
		45'	23 25	45 40	55 45	0.8		

¹Dual class capacities are given for each span. The upper figure is wheeled vehicle class capacity; the lower, tracked vehicle.

²Using expedient approach ramps.

³Trestle braced against the ground with struts, class 0-30.

⁴Trestle spaced 15' apart and braced against each other with bracing struts; spans of length indicated in table between pairs of trestles, class 31-70.

⁵Trestle spaced from 6' to 15' apart with expedient stringers (12 x 12 timbers or deck bauls) across the 2 trestle transoms. Spans of bridge bear on center of trestle pier formed; class 71-100.

⁶Capacities are based on the use of 22 balk deck and 18 balk roadway. Capacities for other types of assembly are shown in the following table:

Capacity

Span	Normal	Cautious	Risk
130'	95/70	105/80	110/90
238' 4"	65/50	88/60	96/67
245'	42/35	59/46	67/53

¹18 balk roadway—23 balk deck width.

²18 balk roadway—28 balk deck width.

Figure 4-23

h. Logistical and Construction Data for Military Fixed Highway Bridges (fig. 4-26).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1		Panel bridges										Beam bridges				Truss and girder bridges	
2		Type T6 (width 13' 6") Effective length of bay 15'			Bailey-type, M2 Effective length of bay 10'							I-beam stringers		WF beam stringers		Truss	Girder
3		Single truss	Double truss	Triple truss	SS	DS	TS	DD	TD	DT	TT	30' span ¹	60' span ¹	27" depth	36" depth	90' span ¹	48" depth ¹
4	Weight per bay (short tons) ²	7.7	15.4	23.1	2.76	3.41	4.01	4.66	5.88	6.46	8.29	12.9	35.3	31.2	116.0	49.9	177.0
5	Cubage per bay (meas tons) ³	61.5	80.0	98.6	9.00	11.00	13.00	14.00	18.00	20.00	26.00	15.5	36.0	28.5	105.0	70.7	142.4
6	Type of issue (class)	IV	IV	IV	II	II	II	II	II	II	II	IV	IV	IV	IV	IV	IV
7	Transportation per bay ⁴	1.3	2.6	3.9	3.40 1.00	2.20 0.70	2.60 0.70	3.00 0.70	3.80 0.90	3.70 0.80	5.50 0.90	No data		No data		No data	
8	Man-hours to erect one bay ⁵	11.2	22.4	33.6	58.00	37.00	49.00	63.00	98.00	171.00	281.00	No data		No data		No data	

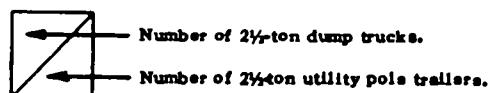
¹Length of span is considered to be one bay.²Data on Bailey-type, M2, bridge do not include weight of ramps, launching nose, footwalks, wear treads, and truss guards. Weight of overhead bracing is included on DT and TT.³Values are approximate only and subject to change because of revised packaging and changes in components of sets.⁴Based on combat loading in 5-ton military bridging truck (loaded for manpower erection) for T6 and 2½-ton dump trucks with 2½-ton utility pole trailers for M2 Bailey. Includes launching nose, grillage, footwalks, and spars. Number of vehicles is based on the number required to transport the minimum length of span of the type of construction indicated, which will carry class 50 tracked loads.⁵Does not include time for preparation of approach roads, assembly sites, or elaborate abutments. Adjustments must be made for specific site conditions. Based on manpower erection of the minimum length span of the type of construction indicated which will carry class 50 tracked loads.

Figure 4-26

4-30. Field Fortifications

a. Priority of Work. The order in which the various defensive measures are to be executed is expressed in the form of priorities. The assignment of priorities does not prevent simultaneous work on several tasks. After the location of combat emplacements has been fixed, the normal priority is—

- (1) Establishing security.
- (2) Positioning weapons.
- (3) Clearing fields of fire, removing objects, masking observation, and determining ranges to probable target location.
- (4) Providing signal communication and observation systems.
- (5) Preparing weapons emplacements and individual positions, to include overhead cover, and camouflaging them concurrently.
- (6) Laying minefields and preparing important demolitions.
- (7) Preparing routes for movement and for supply and evacuation.
- (8) Preparing alternate supplementary positions.
- (9) Preparing obstacles (other than minefields) and less vital demolitions.
- (10) Preparing CBR protective shelters as required.

- (11) Preparing deceptive installations in accordance with deception plans of higher headquarters.

b. Works. (Figures are for daylight; for work at night, increase labor by 50 percent.)

- (1) *Characteristics of personnel and individual weapons emplacements.*
[Located in back of manual]

- (2) *Characteristics of crew-served infantry and artillery weapons emplacements.*
[Located in back of manual]

- (3) *Clearing.* Four man-hours of labor are required for clearing 100 square yards of brush and a few trees up to 12 inches in diameter; for brush only, 2 man-hours.

- (4) *Barbed wire obstacles.*

- (a) *Estimating requirements.* The minimum length of tactical wire entanglements for a defensive position is one and one-fourth times the frontage; minimum protective wire is five times the frontage. The length of tactical wire entanglements for a deliberate defense is five times the frontage; protective wire is six times the frontage.

(b) Wire entanglement materials for 300 yards (275 meters) of entanglements.

1	2	3	4	5	6	7	8	9	10	11
	Pickets				Barbed wire, 400-yd, 115-lb reels ¹	Concertinas	Staples made of 1/4" round drift-pls	Man-hours to erect 300 yd of entanglement ²	Short tons	Measurements tons
	Type of entanglement	Extra long	Long	Medium	Short					
2	Double-apron, 4- and 2-pace.....		91		182	12-13		54	1.50	1.40
3	Double-apron, 6- and 3-pace.....		61		122	11-12		45	1.05	0.98
4	High-wire (less guy wires).....		181			15-18		72	1.80	1.70
5	Low-wire, 4- and 2-pace.....			91	182	9		45	1.10	1.00
6	Four-strand fence.....		91		2	3 1/2-4		18	0.60	0.60
7	Double-belt expedient concertina.....		92		4	2	³ 90	270	36	2.10
8	Triple-belt expedient concertina, pyramided.....	46	92		6	3	³ 135	270	90	3.15
9	Triple-belt standard Dannert concertina.....		146		4	2	54	290	27	2.25

¹ Lower number of reels applies when screw pickets are used; higher number when U-shaped pickets are used. Add difference between these two to the larger number when wood pickets are used.

² With exception of triple-belt concertina, man-hours are based on use of screw pickets. When driven pickets are used, add 20 percent to man-hours. With experienced

troops, reduce man-hours by one-third. Increase man-hours by 50 percent for nightwork.

³ Based on concertinas being made up in rear areas and ready for issue. One expedient concertina opens to 20-foot length (as compared with 50 feet for a commercially made Dannert concertina) and requires 100 yards of stranded barbed wire; also small quantities of No. 10 and No. 16 smooth wire for ties.

(c) *Wire materials for making expedient concertinas for 300 yards (275 meters) of entanglements.*

1	Type of concertina	Standard barbed wire, 400-yd reels	No. 10 wire, 100-lb coils	No. 16 wire, 10-lb coils
2	Double-belt --	23	1	1
3	Triple-belt --	34	1	1

4-31. Minefields

a. *General.* For detailed information pertaining to mine warfare, see FM 20-32.

b. Standard Mines.

	1	2	3	4	5	6	7	8
1	Description	Net wt (lb) (en)	Shipping container			Cubage (cu ft)	Remarks	Storage requirements
			Units per container	Type	Gross wt (lb)			
2	Mine, antitank, HE, light, M7A2.	4.50	8	Metal box	56.0	0.99	Packed complete (W 8 fuzes, mine, AT, M603) (standard).	Under tactical conditions, all mines, fuzes, and detonators will be generally stored in the open. For detailed data on specific storage requirements, refer to TM 9-1345-200.
3	Mine, antitank, HE, heavy, M6A2.	20.00	1	Metal crate	29.2	0.46	Packed complete (W 1 fuze, mine, AT, M603) (WO activator) (standard).	
4	Mine, antitank, HE, heavy, M15.	31.46	1	Wooden box	49.0	1.17	Packed complete (W 1 fuze, mine, AT, M603, and 1 activator) (standard).	
5	Mine, antipersonnel, M2A4-----	5.30	10	Wooden box	76.6	1.24	Packed 1 complete mine (W 1 fuze, mine, M6A1, and 1 spool of four 26-ft length of steel wire/carton, 10 cartons) (10 complete mines W accessories) (standard).	
6	Mine, antipersonnel, M3-----	10.30	6	Wooden box	73.2	0.83	Packed 6 complete mines (W 6 fuzes, mine comb, M7A1, and 6 spools of steel wire) (standard).	
7	Mine, antipersonnel, nonmetallic, M14.	0.20	90	Wooden box.	44.1	1.70	Packed 1/carton (90 mine fuzes integral and 90 detonators, M46, in set up box and 9 wrenches, M22).	
8	Mine, antipersonnel, M16-----	8.25	4	Wooden box	44.8	0.77	Packed 4 mines (W 4 fuzes, mine comb, M-605, sealed mtl center, W 4 spools trip wire, and 1 wrench, M25).	
9	Mine, antitank, nonmetallic, heavy, M19.	-----	2	Wooden box	75.0	1.49	Packed 1 complete mine (W 1 fuze, mine, M606, and 1 activator).	
10	Flare, mine, trip, M49-----	-----	16	Wooden box	44.9	1.03	Packed (16 flares/package, between separators/wooden box).	

c. *Minefield Estimates.* The following table may be used for initial estimates of requirements for material, transportation, and labor required to emplace various minefields (see also para 4-18e):

Manpower, Material, and Transportation Requirements for Minefield Operations

	1	2	3	4	5	6	7
1	Item	Units per 1000 meters of minefield			Nuisance mining		
		Protective ¹	Defensive ² 1-4-8	Barrier ³ 3-4-8	Harassing per km ²	Facility denial per facility	Route mining per km
	<i>Antitank mines:</i>	500	1632	4564	4	12	30
2	Metallic (M-15)	(125)	³ (1306)	³ (3651)			
3	Nonmetallic (M-19)		(326)	(913)	(1)	(2)	(5)
4	Mine, shaped charge (M-21)	(375)			(3)	(10)	(25)
	<i>Antipersonnel mines:</i>						
5	Blast (M-14 or M-25)	1000	12601	12601	15	30	175
6	Fragmentation (M16A1)		6194	6194	25	50	325
7	Directional (M18A1)	1000			5	10	20
	<i>Firing devices:</i>						
8	Trip flares (M-49)	100	⁴ 164	⁵ 1460	⁶ 2	⁶ 4	⁶ 10
9	Barbed wire (400 yd reel) ⁷		100	100			
10	Pickets, long		10.6	11.6			
			140	150			
	<i>Manpower⁸:</i>						
11	Man-hours	370	2420	3213	8	16	71
12	Plt Hrs (30 men)	12.3	80.7	107.1	.27	.57	2.37
13	Co Days (3 plt, 10 hrs/day)	.4	2.7	3.6	.009	.018	.08
	<i>Tonnages:</i>						
14	Short tons	10.83	74.27	142.37	.42	.87	2.296
15	Measurement tons	16.43	81.44	161.86	.23	.53	2.34
	<i>Trucks required:</i>						
16	2½ ton (M35) 4 tons or 407 cu ft	2.7	18.6	35.6	.1	.2	.6
17	5 ton (M54) 6 tons or 513 cu ft	1.8	12.4	23.7	.07	.15	.38
18	5 ton (M51) 7½ tons or 135 cu ft	4.9	24.2	48.0	.07	.15	.7

¹ No irregular outer edge (IOE) in protective field.

² IOE cluster composition for defensive and barrier minefields is 1-2-2.

³ Reduce number of mines in defensive and barrier minefields 50% when using M-21 mines in place of M-15 mines.

⁴ 5% of M-15 and M-19 booby trapped with 2 devices.

⁵ 20% of M-15 and M-19 booby trapped with 2 devices.

⁶ 100% of M-19 booby trapped with 2 devices. M-21 cannot be booby trapped with devices.

⁷ 2 sides and rear of minefield only.

⁸ Based on laying rate of 4 AT, 8 AP fragmentation, or 16 AP blast mines per man-hour.

Note 1. The above data are based on a standard pattern (3 strips for protective, 8 for defensive, and 9 for barrier minefields).

Note 2. No safety factor for loss or damage to mines and fuzes in transport is included in the data. Normally a ten percent allowance should be made for such loss.

d. Minefield Clearance. The following table may be used for initial estimates of time and materiel requirements for clearing or breaching minefields.

Minefield Breaching Clearance
(Average time and materiel requirements)

1	Method	Width of cleared lane (in yards)/ (meters)	Man-hours required per 100 yards/ 91.440 meters	Remarks
	MANUAL			
2	Location by probing -----	1/.914 (footpath)	15—20	See note.
3	Removal by rope or explosives -----	4/3.657 (vehicle lane)	35—40	See note.
4	Location by detector, assisted by probing.	4/3.657 (vehicle lane)	25—30	See note.
5	Removal by rope or explosives -----	25/22.860	200—225	See note.
	EXPLOSIVES			
6	Demolition snakes, M3A1 -----	3—4/2.74—3.65	0.75	Employment time only. 90—100 hr required for assembly of M3A1.
7	Cable, antipersonnel, M1 -----	1/.914 (footpath)	3—4	Cable, antipersonnel, M1, is not effective against antitank mines.
8	Bangalore torpedo -----	1/.914 (footpath)	3—4	See note.

Note. Based on average conditions of visibility and moderate enemy activity and normal U. S. countermeasures: i.e. screening of enemy observation and counterbattery fires against hostile artillery or other weapons covering the field.

e. Artificial Obstacle Requirements. The following table may be used for initial estimates of obstacle types and materiel and manpower requirements for artificial obstacles.

*Average Requirements for Artificial Obstacles
(400 Sq Km)*

Item and unit	Defensive operations				Retrograde operations				Offensive operations			
	Easy movement	Moderate movement	Difficult movement	Very difficult movement	Easy movement	Moderate movement	Difficult movement	Very difficult movement	Easy movement	Moderate movement	Difficult movement	Very difficult movement
<i>Minefields:</i>												
Barrier (Km).....	10.3	7.8	5.2	2.6	1.0	0.8	0.5	0.3	0.3	0.2	0.1	0.1
Defensive (Km).....	5.2	4.0	2.5	1.3	0.4	0.3	0.1	0.1	0.2	0.1	0.1	0.1
Protective (Km).....	0.3	0.2	0.1	0.1	0.5	0.4	0.3	0.1	0.5	0.4	0.3	0.1
<i>Nuisance mining:</i>												
Harassing (Sq Km).....	70	55	35	20	250	180	150	75				
Facility denial (ea).....	70	85	100	100	55	65	65	65	7	7	6	6
Route mining (Km).....	45	35	25	12	115	100	70	45				
<i>Obstacles:</i>												
Highway bridges (ea).....	40	35	30	15	35	30	20	15	4	4	3	2
Railroad bridges (ea).....	3	3	3	2	3	3	3	2				
Tunnels (ea).....				1				1				
Abatis (ea).....	7	15	25	30	6	8	12	14	1	1	1	1
Road craters (ea).....	75	68	68	66	28	28	30	36	1	1	1	2
<i>Barbed wire entanglements:</i>												
Double apron 4/2 pace (km).....	25	25	25	25	2.5	2.5	2.5	2.5				
4-strand protective (km).....	10	10	10	10	1	1	1	1				
Triple concertina (km).....	6.5	6.5	6.5	6.5	0.5	0.5	0.5	0.5				
<i>Material:</i>												
Antitank mines (ea).....	58,117	44,478	29,953	15,678	10,577	8,841	6,075	4,012	2,030	1,360	842	742
Antipersonnel mines:												
Fragmentation (ea).....	118,132	93,914	63,469	34,996	59,647	51,013	36,567	25,253	4,017	2,679	1,900	1,700
Blast (ea).....	198,270	153,820	100,874	52,538	42,911	37,024	23,987	17,078	6,741	4,228	2,892	2,692
Firing devices, assorted (ea).....	16,761	12,844	8,722	4,569	3,396	2,837	2,007	1,315	499	337	187	187
Trip flares.....	3,655	3,275	2,855	2,475	400	358	300	258	100	70	30	30
Explosives (total) (lbs).....	99,000	93,800	93,800	88,600	65,300	60,300	54,500	52,600	5,100	5,100	4,100	3,100
Barbed wire (400-yd reels).....	1,214.6	1,172.9	1,126.8	1,084	120	116.6	110	108.7	5.6	3.4	2.3	2.3
Concertina coils (ea).....	1,281	1,281	1,281	1,281	98.6	98.6	98.6	98.6				
Short tons.....	2,291.2	1,820.4	1,324.8	826	655.3	559.7	415.6	301.4	72.5	49.7	32.9	30
Measurement tons.....	2,473.7	1,948	1,383.2	827.8	610.1	519.3	372.3	265.5	79.6	53.6	34.7	30.8
<i>Manpower:</i>												
Platoon hours (30 men).....	1,981.1	1,600	1,174	753.5	596.6	512.6	382.6	281.9	63	43	29.8	27.4
Battalion days (10-hr day, 4 companies, 3 platoons each).....	16.5	13.3	9.8	6.3	5	4.3	3.6	2.3	0.5	0.4	0.3	0.2

Notes 1. Terrain types having following characteristics:

a. *Movement.*

- (1) *Easy.* Rolling or level, mostly open, trafficable land. (No one obstacle or combination of obstacles comprises more than 25% of the area).
- (2) *Moderate.* Low hills, scattered forest, poorly drained land. (Any one type of obstacle or combination of obstacles comprises 25% to 50% of the area).
- (3) *Difficult.* High hills, broken forests, poorly drained land. (Any one type of obstacle or combination of obstacles comprises 50% to 75% of the area).

- (4) *Very difficult.* Mountains, forests, marshes. (Any one type of obstacle or combination of obstacles comprises 75% of the area.)

b. *Obstacles.*

- (1) Hills and mountains—steep slopes and rough terrain.
 - (2) Forests—dense woods with trees that are large enough to stop tanks.
 - (3) Marsh—wet, swampy, untrafficable ground.
2. Does not include tactical wire.

4-32. Demolition

a. Explosive requirements for various demolition tasks vary widely, depending on the size of the structure, type of construction, type of materials in the structure, age, location, necessary safety precautions, and other factors.

b. The following table may be used for initial estimates of explosive requirements for the more common types of demolition tasks required in creating obstacles.

Material and Manpower Requirements for Individual Barrier Targets

Target	Material				Manpower
	TNT (lbs)	Cratering charge (40 lbs)	Shaped charge (40 lbs)	Thermite grenades (each)	Squad hrs. (10 men)
Highways:					
Major bridge (over 400') -----	1,200				3
Minor bridge (up to 400') -----	800				2
Tunnels -----	12,000				5
Road craters:					
2-lane road (27') -----		7	4		2
4-lane road (70') -----		19	12		4
Railroads:					
Major bridge (over 400'):					
Single track -----	3,000				6
Double track -----	4,500				6
Minor bridge (up to 400'):					
Single track -----	2,000				4
Double track -----	3,000				4
Tunnel -----	12,000				5
Terminal facilities -----	1,000			50	4
Rolling stock (locomotive & 30 cars) -----	50			125	4
Airfields:					
Runway (per 1000') -----	5,500		25		8
Fuel storage (per tank):					
Below ground -----	400			1	1
Above ground -----			1	1	0.2
Radar/radio apparatus -----	30			10	0.5
POL Facilities:					
Storage and handling -----	50	15		10	1
Refining facilities -----	100			15	1
Distributing facilities -----	20			2	0.2
Electric Power Denial:					
Generator -----	150			10	1
Transformer station -----	100			25	1
Telecommunications Denial:					
Telegraph exchange -----	25			1	0.1
Telephone exchange -----	25			2	0.2
Repeater/radio station -----	50			2	0.2
Waterways Denial:					
Lock -----	200				1
Wier -----	1,000				2
Levee wall -----		15	10		2
Dam (navigational) -----	1,000				2.5

c. For classified data, see FM 101-10-3, paragraph 4-8.

4-33. Ford Trafficability¹

Type of traffic	Fordable depth (ft/m)	Minimum width (ft/m)	Maximum desirable slope for approaches (percent) ²
Foot -----	3.3/1.0	3.3/1.0 (single file) 6.6/2.0 (column of 3's)	100
Trucks and truck-drawn artillery. ³	2.0/0.6	12.0/3.6	33
Light tanks ³ -----	3.3/1.0	14.0/4.2	50
Medium tanks ^{3,4} --	4.0/1.2	14.0/4.2	50

¹ Moderate current (not over 1.5 m per sec), hard bottom.² Based on hard, dry surface.

³ May be materially increased by suitable waterproofing. For streams of high current velocity, the attitude of the tank to the current has an appreciable effect on the depth which may be forded. The length of time the tank is exposed to the current also has an appreciable effect. Four feet is the design fording depth of modern U.S. tanks. Experience indicates that tanks can ford slightly greater depths for short distances without going out of action.

⁴ Depths up to 4.8 meters (14.1 ft) can be negotiated with deep water fording kit.

4-34. Load-Bearing Capacity of Ice

The strength of ice varies with the structure of the ice; the purity of the water from which it is formed; the cycle of formation (freezing, thawing, and refreezing); temperature; snow cover; and water currents. The following tables are based on the characteristics of good quality waterborne ice. They may be used as a guide until load tests are made to determine the actual load-bearing capacity of the ice.

Ice Load-Carrying Capacity for Sleds

Ice thickness (cm/in)	Gross sled weight (tons)
15/6-----	1
17.5/7-----	2
23/9-----	5
33/13-----	10
40/16-----	15
46/18-----	20

Ice Load-Carrying Capacity for Personnel and Equipment

Load type	Gross weight (tons)	Minimum ice thickness (cm/in)	Minimum distance between loads (m/yd)
Soldier on skis or snowshoes -----	0.1	3/1.2	5/5.5
Soldier on foot -----	0.1	5/2	5/5.5
Infantry (column of 2) -----		7.6/3	7.3/8
Infantry (column of 4) -----		10/4	10/11
Wheeled vehicle loads up to -----	3.5	23/9	15/16.5
Wheeled vehicle loads up to -----	6.0	30/12	20/22
Wheeled vehicle loads up to -----	10.0	40/16	25.6/28
Wheeled vehicle loads up to -----	15.0	61/24	30/33
Tracked vehicle loads up to -----	3.5	20/8	15/16.5
Tracked vehicle loads up to -----	10.0	30/12	20/22
Tracked vehicle loads up to -----	12.5	40/16	25.6/28
Tracked vehicle loads up to -----	25.0	61/24	40/44
Tracked vehicle loads up to -----	45.0	71/28	50/55
Tracked vehicle loads up to -----	60.0	81/32	60/66



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CHAPTER 5

LOGISTICS—SUPPLY

Section I. GENERAL

5-1. Use of Logistical Data

The logistical data contained in this and the succeeding four chapters (Logistics—Evacuation and Hospitalization; Logistics—Transportation; Logistics—Service; and Logistics—Management) are of the type suitable for first approximation planning. They are, for the most part, based on World War II and Korean experience, modified to reflect changes in concept and organization. Detailed logistical planning should be based on the references listed in the foreword.

5-2. General Supply Factors

a. The following broad general factors are useful for long-range planning when the figures in the remainder of this chapter are too detailed. They should be used only in forming rough estimates in logistical planning or as "rule of thumb" checks against the calculations of technical planners. The overall theater factors given below include only military requirements and are based on the following ratios between ground and air: For each division slice of approximately 43,250 men, there will be 2 airwing slices of 7,000 men each (para 5-53a).

b. Initial equipment and initial 30 days maintenance.¹

	1	2	3	4	5	6
1	Item	Total requirements per man in the theater (Army plus AF) ¹		Shipped from CONUS		Procured in the theater of operations ²
		Measurement tons per man	Short tons per man	Measurement tons per man	Short tons per man	Short tons per man
2	Initial equipment.....	8.00	1.80	8.00	1.80	-----
	30 days maintenance:					
3	Dry cargo.....	1.35	0.75	1.10	0.60	0.15
4	Bulk POL.....	³ 1.046	1.001	³ 1.046	1.001	-----
5	U.S. Army.....	⁴ (.768)	⁴ (.747)	⁴ (.768)	⁴ (.747)	-----
6	USAF.....	⁵ (1.905)	⁵ (1.785)	⁵ (1.905)	⁵ (1.785)	-----
7	Total.....	13.069	6.083	12.819	5.933	0.15

¹ For use as broad initial planning factors. Does not include tonnages for buildup of theater reserves.

² Applicable only in situations when procurement in theater of operations is feasible.

³ Bulk POL rarely is expressed in measurement tons. This figure is provided merely for the purpose of comparison with dry cargo.

⁴ Figure in () reflects bulk POL required per Army man in theater of operations.

⁵ Figure in () reflects bulk POL required per AF man in theater of operations.

Section II. CLASS I SUPPLY

5-3. Characteristics of Standard Rations

	1	2	3	4	5	6
1	Type ration	Packaging information			Average weight per ration including packing (lb)	Remarks
		Number rations per package (case)	Weight per package (lb) (case)	Volume per package (cu ft) (case)		
2	Field A-----				6.0	This is the basic field ration. It consists of such perishables as fresh and frozen meats, vegetables, and fruit. It is intended for use primarily under stable conditions and during static phases of military operations when normal cooking and refrigeration facilities are available. It should be issued in preference to any other type of ration whenever it is available and circumstances permit its use.
3	Standard B ration for Armed Forces.				6.0	Same as the field ration, with nonperishables substituted for perishables. Designed for use where refrigeration facilities are lacking or impracticable but where kitchen and cooking facilities are available. (See SB 10-495.)
4	Small detachment, 5 persons.	5 rations-----	28.5	1.10	5.8	Five different menus. Should not be eaten cold. Intended to be served hot. Field cooking equipment required for preparation.
5	Meal, combat, individual.	4 packets (12 meals).	24.0	0.85	4.8	Designed for use as individual meal packets or in multiples of three for a complete ration. Not to be used over extended periods.
6	Trail, frigid, individual---	8 rations-----	34.0	1.60	4.0	Designed for use in extremely cold climates by small patrols or trail teams for short periods of time (1-3 days) under conditions where resupply is impossible.
7	Ration supplement, sundries pack (1 pack per 100 men).		47.0	1.90	-----	Composed of items necessary to the health and comfort of troops; e.g., essential toilet articles, tobacco, and confections that normally are obtained at an exchange. Made available in theaters of operation for issue pending establishment of adequate exchange service facilities.
8	Ration supplement, aid station (makes 205 8-oz drinks).		20.0	1.10	-----	Designed for use at forward medical aid stations to provide combat casualties with hot, stimulating beverages which alleviate shock and contribute to patient comfort.
9	Food packet, individual, assault.	24 packets----	29.0	1.10	1.1	It is packaged so that it may be carried by the individual; it is provided troops in the initial assault phase of combat, when food is required that is lightweight, highly palatable, and conveniently carried by the individual. The packet will not be utilized for other than the phase of battle for which intended, usually not to exceed 24-30 hours.
10	Food packet, survival, arctic, SA.	24 packets----	34.0	0.70	1.5	Designed for survival kits carried aboard aircraft operating over arctic regions. May be issued as an item of personal equipment for military personnel participating in active operations, in addition to its primary use by the Air Force. Intended for emergency use only. Each packet contains food for one man for 1 day for survival in a cold environment.

	1	2	3	4	5	6
1	Type ration	Packaging information			Average weight per ration including packing (lb)	Remarks
		Number rations per package (case)	Weight per package (lb) (case)	Volume per package (cu ft) (case)		
11	Food packet, survival, ST.	24 packets---	36.0	0.70	1.5	Designed to be carried in survival kits of aircraft operating over tropical regions. Packet may be issued as an item of personal equipment for military personnel engaged in active operations. Intended for emergency use only. Each food packet contains food for one man for 3 days or three men for 1 day in a tropical environment.

5-4. Time Elements in Class I Supply

conditions, they should be used as a guide only when actual experience is lacking.

While the figures shown in the following table are an approximate average for combat

	1	2	3
1	Work	Daylight (min)	Dark (min)
2	Unload rations for one division at class I distributing point and prepare for distribution to battalions or units of similar size.	100	125
3	Distribution of class I supplies to battalion or unit of similar size by higher echelon at one distributing point.	20	20
4	Distribution of class I supplies to separate battalion or unit of similar size by higher echelon.	15	15
5	Preparation of 1 day's class I supplies for issue at battalion class I distributing point.	30	45
6	Physical distribution by battalion supply agencies of 1 day's class I supplies (transfer of loads) to kitchen.	15	20
7	Unload kitchen equipment from trucks, set up, and be prepared to begin cooking (or vice versa).	20	20
8	Breakdown of subsistence into three meals at kitchen (breakdown accomplished by mess personnel).	15	20
9	Personnel to prepare, cook, and be ready to serve a hot meal, starting with a hot kitchen. (Issue of subsistence for cold noon meal included if hot meal being prepared is breakfast.)	120	150
10	Serving a hot meal to troops from a kitchen truck with majority of men being served at the truck.	45	60
11	Serving a hot meal to troops by means of carrying parties (when kitchen is located within a 900 meter radius of company).	90	120

Section III. CLASS II AND IV SUPPLY—DIMENSIONS AND WEIGHTS (NOT ALL INCLUSIVE)

5-5. Items of Chemical Equipment

	1	2	3	4	5	6	7	8	9	10
1	Class	Type or model ¹	Dimensions			Sq ft	Cu ft	Short tons	Measure- ment tons	Remarks
			Length (in)	Width (in)	Length (in)					
2	Clothing impregnating	Analyzing kit, impregnite, M26	17	14	10	1.7	1.3	0.023	0.03	Packaged in 11 crates
3		Impregnating plant, clothing, M2A1					5,500.0	50.000	162.50	
4		Impregnating plant, clothing, M2A2					7,323.0	55.388	183.08	Packaged in 12 crates
5		Impregnating set, clothing, field, M3	24	12	12	2.0	1.7	0.027	0.04	Packed 60 items per box
6		Testing kit, impregnite in clothing, ABC-M2.	18	14	7	1.7	1.0	0.012	0.03	
7	Compressor	Compressor, reciprocating, power-driven, flamethrower, 3½ CFM, AN-M4.	30	22	27	4.6	13.6	0.083	0.34	Packed 12 items per box
8		Compressor, reciprocating, power-driven, 7 CFM, M1A1.	72	36	43	18.0	69.0	0.65	1.73	
9	Decontaminating	Decontaminating apparatus, portable, DS2, 1½-qt, ABC-M11.					2.7	0.031	0.07	Packed 12 items per box
10	Detection	Analyzing kit, chemical agent, M10A1	30	17	8	3.5	2.1	0.023	0.05	Packed 384 items per box
11		Crayon, vesicant detector, M7A1					0.6	0.018	0.02	
12		Detector kit, chemical agent, VGH, AN-M15A1A.	24	18	9	3.0	2.3	0.024	0.06	Packed 30 items per box
13		Detector kit, chemical agent, ABC-M18A1	22	13	10	2.0	1.7	0.015	0.04	Packed 10 items per box
14		Food testing and screening kit, chemical agents, ABC-M3.					0.8	0.023	0.02	Packed 24 items per box
15		Paper, chemical agent detector, VGH, ABC-M8.					1.8	0.40	0.05	Packed 2000 items per box
16		Sampling kit, chemical agent, M12	20	18	11	2.8	2.3	0.022	0.06	Packed 24 items per box
17		Water testing kit, chemical agents, AN-M2					1.0	0.025	0.03	
18		Water testing kit, poisons, M4A1	31	19	7	4.1	2.3	0.023	0.06	Component of M132 selfpropelled flamethrower which is an Ordnance item.
19	Flamethrower	Flamethrower, mechanized, main armament, APC-mounted, M10-8.								
		M10 unit					235.0	1.600	5.88	Component of M67A1 flamethrower tank which is an Ordnance item.
		M8 cupola					155.0	1.050	3.88	
20		Flamethrower, mechanized, main armament, turret-mounted, M7A1-6.					2,200.0	12.000	55.00	Packed in 65 boxes
21		Flamethrower, portable, ABC-M9-7	26	28	16	5.1	6.8	0.032	0.17	Packed in 65 boxes
22		Flamethrower, portable, M2A1-7	34	23	19	5.5	8.2	0.054	0.21	
23	Laboratory	Laboratory, chemical, base, M2					1,356.0	11.015	33.90	

24		Laboratory, chemical, mobile, M3					145.0	1.579	3.63	Packaged in 13 boxes
25	Maintenance and servicing.	Beam, hoisting, liquid gas tank, M1	85	6	11	3.6	3.2	0.10	0.08	
26		Dispensing pump, hand-driven, M2A1	56	18	11	7.0	6.5	0.06	0.16	
27		Hoisting unit, tripod, drum, M1	139	12	10	11.6	9.6	0.094	0.24	
28		Indicator, eyepiece leakage, M2	42	28	24	8.2	17.0	0.113	0.43	
29		Indicator, outlet valve leakage, M4A1	26	22	22	4.1	7.2	0.060	0.18	
30		Maintenance and repair set, Cm1C equipment, M1A1.					104.0	1.295	2.60	Packaged in 7 boxes
31		Mechanism, valve replacement, M1	39	38	16	17.3	13.7	0.188	0.34	
32		Service kit, portable flamethrower-riot control agent disperser, M27.					3.2	0.043	0.08	
33		Vulcanizer, hot patch, faceblank, M1	24	18	11	3.0	2.8	0.028	0.07	
34	Protective	Breathing apparatus, compressed air, ABC-M15A1.	30	14	8	2.9	1.9	0.016	0.05	
35		Breathing apparatus, oxygen generating, M20.	23	18	9	2.9	2.2	0.021	0.06	
36		Filter unit, gas-particulate, electric motor driven or gasoline engine driven 300 cfm, ABC-M6A1.					37.1	0.353	0.93	
37		Filter unit, gas-particulate, gasoline engine driven, 1200 cfm, M10.					132.0	0.92	3.30	
38		Filter unit, gas-particulate, electric motor driven, 2500 cfm, M11.					188.0	1.48	4.70	
39		Filter unit, gas-particulate, gasoline engine driven, 2500 cfm, M11.					253.9	1.20	6.35	
40		Filter unit, gas-particulate, electric motor driven, 5000 cfm, M12.	158	53	60		290.8	2.09	7.27	
41		Filter unit, gas-particulate, gasoline motor driven, 5000 cfm, M12.	158	52	60		285.3	2.00	7.14	
42		Filter unit, gas-particulate, hospital, 6-man, 12 cfm, ABC-M7A1.	39	15	18	4.1	5.7	0.069	0.14	
43		Filter unit, gas-particulate, tank, 4-man, 12 cfm, ABC-M8A3.					1.8	0.026	0.05	
44		Mask, protective, aircraft M24					5.1	0.036	0.13	Packed 10 items per box
45		Mask, protective, field, ABC-M17	28	20	14	3.9	4.1	0.029	0.10	Packed 10 items per box
46		Mask, protective, headwound, ABC-M18	24	18	11	3.0	2.7	0.020	0.07	
47		Mask, protective, tank, ABC-M14A2	22	24	17	3.7	5.1	0.036	0.13	Packed 10 items per box
48		Protection and treatment set, chemical agents, M5A3.					1.4	0.025	0.04	Packed 70 items per box
49		Winterization kit, field protective mask, M4.					1.1	0.013	0.03	Packed 100 items per box
50		Winterization kit, tank protective mask, M4.					4.0	0.025	0.10	Packed 100 items per box
51	Riot control agent disperser.	Disperser, riot control agent, helicopter or vehicle-mounted, M4.					31.0	0.156	0.78	

	1	2	3	4	5	6	7	8	9	10
1	Class	Type or model ¹	Dimensions			Sq ft	Cu ft	Short tons	Measure- ment tons	Remarks
			Length (in)	Width (in)	Length (in)					
52		Disperser, riot control agent, helicopter or vehicle-mounted, M5.					27.0	0.130	0.68	Packet 2 items per box
53		Disperser, riot control agent, portable, M3	34	22	15	5.2	6.8	0.048	0.17	
54	Smoke generator	Generator, smoke, mechanical, pulse jet, ABC-M3A3.	51	24	29	8.5	20.0	0.122	0.50	
55		Mount, fog oil drum, M3	41	7	6	2.0	1.0	0.025	0.03	
56	Smoke tank	Accessory set, airplane smoke tank, M10					1.9	0.024	0.05	
57		Beam, hoisting, airplane smoke tank, M2					0.6	0.021	0.02	
58		Filling line, metal, airplane smoke tank, M3.	66	10	6	4.6	2.2	0.024	0.06	
59		Smoke tank, airplane, M10	87	16	30	9.7	23.5	0.089	0.59	
60		Stand, airplane smoke tank, carrying, M1					12.4	0.038	0.31	
61	Trailer	Decontaminating apparatus, power-driven, trailer-mounted, 200-gal, M8A2.	154	69	80	73.8	492.0	1.325	12.30	
62	Truck	Decontaminating apparatus, power-driven, truck-mounted, 400-gal, M9.	261	87	105	157.7	1379.3	8.388	34.50	
63		Decontaminating apparatus, power-driven, truck-mounted, M3A3.	261	87	105	157.7	1379.3	3.388	34.50	
64		Service unit, flamethrower, truck-mounted, M4A1.					1656.0	8.250	41.40	
65	Water heater	Heater, water, oil, skid-mounted, 600 gph, M2.	58	22	43	8.9	31.2	0.475	0.80	
66		Heater, water, oil, M1					79.7	0.683	1.78	
67	Miscellaneous	Apparatus, filling, field, landmine, M2					8.0	0.099	0.20	
68		Safety equipment set, respiratory, gasoline tank cleaning, No. 1.	40	22	13	6.1	6.7	0.113	0.17	

¹ All items crated except trucks.

5-6. Items of Engineer Equipment^{1, 2, 3, 4, 5}

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
			(Dimensions—in)						
2	Boat.....	Boat, brg erection, gas-eng driven, aluminum, 19-ft long.	234	97	72	158	948	1.6	23.6
3		Boat, brg erection, gas-eng driven, aluminum, 27-ft long.	324	96	80	216	1,440	2.9	36.0
4	Bridge.....	Brg, fxd, steel panel, Bailey-type, M2.....						125.0	175.0
5		Brg, fltg, ft, aluminum.....						9.1	34.3
6		Brg, fltg, M4.....						232.8	
7		Brg, fltg, pneumatic, class 60, steel superstructure.....						388.0	950.0
8		Brg, fltg, highway, aluminum deck, balk superstructure, on pneumatic floats, M4T6.						92.5	205.0
9		Brg erection set, fltg brg, W aluminum deck, balk superstructure.						2.0	4.4
10	Construction equipment.....	Air conditioner, tlr-mtd, gas-eng driven, 26,500 Btu/hr.	102	66	62	47	241	1.0	6.0
11		Auger, earth, skid-mtd, gas-eng driven, model HDM-S (TM 5-9132).	133	34	60	31	157	2.6	3.9
12		Compressor, air, reciprocating, tlr-mtd, diesel-eng driven, 315 CFM, Joy model WK-80-315.	131	80	77	73	467	2.9	12.6
13		Compressor, air, reciprocating, gas-eng driven, trk/skid-mtd, 80 CFM, 5,000 psi, Clark model HO-6-0C1.	131	81	44	74	271	5.0	6.8
14		Compressor, air, reciprocating, gas-eng driven, trk-mtd, 80 CFM, 5,000 psi, Joy model 80-HGC2-MS-1 and 80-HGC3-MS-1 (TM 5-4310-211-10).	144	81	65	81	439	3.7	11.0
15		Compressor, air, reciprocating, tlr-mtd, 15 CFM, 3,500 psi, Joy model 15-HGP5-MS-1 (TM 5-4310-203-10).	82	68.5	40.8	39	133	1.0	3.3
16		Compressor, air, rotary, wheel-mtd, diesel-eng driven, 600 CFM.	168	72	99	84	693	5.0	17.5
17		Compressor, reciprocating, trk-mtd, W gas power unit, 80 CFM, air-cooled.	261	96	111	175	1,614	11.9	40.2
18		Compressor, air, wheel-mtd, elec-mtr driven, AC, 220/440 v, 3 ph, 60 cy, 15 CFM, 3,500 psi, Davey model RPC-15 (TM 5-4310-214-10).	72	60	48	30	120	0.86	3.0
19		Crane-shovel, basic unit, crawler-mtd, 10-ton cap., W 35-ft boom at 12-ft radius, ¾ cu yd, gas-eng driven, Koehring model 304.	176	116	130	142	1,536	17.0	39.9

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measure- ment tons
			(Dimensions—in)						
20	Construction equipment— Continued	Crane-shovel, basic unit, crawler-mtd, 40-ton cap., W 50-ft boom at 12-ft radius, 2 cu yd, diesel-eng driven, Baldwin-Lima-Hamilton model 802.	250	136	143	236	2,904	66.3	72.6
21	-----	Crane-shovel, basic unit, trk-mtd, 3-ton cap., W 25-ft boom at 10-ft radius, $\frac{3}{8}$ cu yd, 2 eng, gas-eng driven, 6 x 6; air-trans, ph II, Quick-way model N-383-AB.	258	93	122	167	1,695	9.2	42.4
22	-----	Crane-shovel, basic unit, trk-mtd, 20-ton cap., W 30-ft boom at 10-ft radius, $\frac{3}{4}$ cu yd, 2 eng, gas-eng driven, 6 x 6, Gar Wood model M-20-A(F).	339	109	150	256	3,207	28.5	80.2
23	-----	Crane-shovel, power unit, abn, $7\frac{1}{2}$ -ton, $\frac{1}{2}$ cu yd.	270	98	81	184	1,241	7.5	31.1
24	-----	Crane, tractor mounting, cen, revolving, $2\frac{1}{2}$ -ton, lift at 7-ft radius, 12- to 18-ft telescopic boom, for tractor, full-tracked, low-speed.	144	72	96	72	576	9.5	14.4
25	-----	Crane, tractor, towed, 20-ton, 20-ft height of lift, wheeled, pneumatic tires, Le-Tourneau-Westinghouse model M-20.	331	111	118	256	2,509	5.7	62.7
26	-----	Crusher, air-trans, jaw-type, wheel-mtd, 15 tons/hr.	204	94	91	133	1,010	7.9	25.2
27	-----	Distributor, bituminous material, trk-mtd, 800-gal.	328	96	99	218	1,805	11.0	45.1
28	-----	Distributor, bituminous, tankless, trl-mtd, W distributor attached.	120	84	86	70	501	2.1	12.5
29	-----	Distributor, water, tankless, trl-mtd, W distributor attached.	180	78	73	98	592	1.1	14.8
30	-----	Distributor, water, trk-mtd, 1,000-gal.	304	91	103	192	1,648	10.6	41.2
31	-----	Ditching mach, ladder-type, crawler-mtd, 18-24 in. x 8 ft.	294	132	135	270	3,030	15.0	75.8
32	-----	Grader, road, mtz, diesel-eng driven, 7,000-8,975-lb DBP, 10-ft, air-trans.	263	82	84	149	1,050	7.3	26.3
33	-----	Grader, road, mtz, diesel-eng driven, tandem, 12,500-14,475-lb DBP, 12-ft.	300	94	91	196	1,482	11.7	37.1
34	-----	Grader, road, mtz, 4 x 4, diesel-eng driven, 14,500-18,000-lb DBP, 13-ft.	291	95	104	192	1,664	11.0	41.6
35	-----	Grader, road, towed, leaning wheel, 12-ft mold-board.	382	118	96	312	2,500	6.2	62.6
36	-----	Heater, asphalt, trl-mtd, 3-car cap., 42 HP.	190	66	79	87	573	2.5	14.3
37	-----	Kettle, asphalt, skid-mtd, gas-circulating pump, 750-gal.	152	82	53	87	384	3.3	9.6
38	-----	Loader, scoop-type, diesel-eng driven, 4-wheel, $1\frac{1}{2}$ cu yd.	209	84	81	122	825	7.9	20.6

39	Loader, scoop-type, diesel-eng, driven 4-wheel, hyd front loading, vertical lift front dump, 2½ cu yd, air-trans.	248	105	97	181	1,464	14.8	36.6
40	Loader, scoop-type, rubber tires, tractor-mtd, hyd-op, 1½ cu yd.	204	85	80	120	959	4.5	23.9
41	Lubricating and svc unit, power-op, tlr-mtd, stor tk, 12 CFM.	166	83	78	96	622	3.7	15.5
42	Mixer, concrete, gas-eng driven, end discharge, tlr-mtd, 16 cu ft.	115	98	127	78	828	2.9	20.7
43	Powerplant, tlr-mtd, 5 kw.	144	72	72	72	432	1.5	10.8
44	Roller, road, gas-eng driven, 2-axle tandem, 5- to 8-ton.	177	63	86	77	555	6.6	13.9
45	Roller, road, gas-eng driven, 3-axle tandem, 9- to 14-ton.	268	63	87	117	850	9.5	21.3
46	Roller, road, gas-eng driven, 3-wheel, 10-ton, W scarifier.	205	77	81	110	742	10.1	18.5
47	Roller, road, towed, pneumatic tires, 4 tires, 85,000-lb cap.	298	96	92	198	1,522	7.4	38.1
48	Roller, road, towed, sheepsfoot, 2 drums in line.	175	115	58	140	676	3.0	16.9
49	Roller, road, towed, sheepsfoot, 3 drums in line.	139	180	54	174	784	4.2	19.5
50	Roller, road, towed, wheeled, 13 pneumatic tires.	174	89	46	108	412	1.8	10.3
51	Rooter, road, cable-op, 24-in. depth.	240	98	108	163	1,470	3.8	36.8
52	Scraper, road, towed, cable-op, 8 cu yd.	355	118	120	291	2,910	7.8	72.7
53	Scraper, road, towed, cable-op, 12 cu. yd.	376	137	130	357	3,880	10.2	96.9
54	Slt, 60-in., W powerplant and con sta, trk-mtd.	280	96	140	186	2,180	9.3	54.4
55	Stlr, tk, steel, 1,500-gal, W pump.	216	96	90	144	1,080	3.6	27.0
56	Tank, asphalt, stor, W steam coils and fittings, 4,000-gal.	234	96	109	156	1,416	5.0	35.4
57	Tractor, full-tracked, low-speed, diesel-eng driven, 8,600-12,000-lb DBP, air-trans, ph I, W loader, scoop-type, hyd-op, 1-cu yd bucket (D-4).	174	73	72	88	528	8.3	13.2
58	Tractor, full-tracked, low-speed, diesel-eng driven, 8,600-12,000-lb DBP, 60-in. min gage.	156	96	84	103	728	8.5	18.5
59	Tractor, full-tracked, low-speed, diesel-eng driven, 12,100-17,000-lb DBP, air-trans, ph I, W bulldozer (D-6).	190	95	73	125	764	11.4	19.1
60	Tractor, full-tracked, low-speed, diesel-eng driven, 17,100-24,000-lb DBP, W angledozer (D-7).	219	98	80	149	995	17.8	24.8
61	Tractor, full-tracked, low-speed, diesel-eng driven, 17,100-24,000-lb DBP, 74-in. min gage, W angle-dozer, earthmoving, cable-op, rear mounting, 2-drum.	219	163	115	248	2,356	15.2	58.9

1	Class	Type or model	3	4	5	6	7	8	9
			Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
			(Dimensions—in)						
62	Construction equipment— Continued	Tractor, full-tracked, low-speed, diesel-eng driven, 17,100-24,000-lb DBP, 74-in. min gage, Wangle-dozer, earthmoving, cable-op: W pneumatic cable, front, 1 drum; WWN, reversible, rear, 1 drum.	223	154	82	238	1,618	17.7	40.4
63	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 17,100-24,000-lb DBP, 74-in. min gage, W bulldozer, earthmoving, cable-op; rigid inside track frame, pneumatic cable, front, 1 drum; WWN, reversible, rear, 1 drum.	208	105	115	152	1,444	17.2	36.1
64	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 17,100-24,000-lb DBP, 74-in. min gage.	163	98	79	111	731	12.8	18.0
65	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 24,100-32,000-lb DBP, W angledozer (D-8).	240	104	90	174	1,300	20.0	32.5
66	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 24,100-32,000-lb DBP, 74-in. min gage, W bulldozer, earthmoving, cable-op, tilting, outside track frame, pneumatic cable, rear, 2 drums.	222	114	126	175	1,837	19.9	45.9
67	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 24,100-32,000-lb DBP, W bulldozer, earthmoving, cable-op, tilting, outside track frame, pneumatic cable, front, 1 drum, rear, 2 drums.	230	136	95	217	1,714	23.5	42.8
68	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 30,100-42,000-lb DBP, 78-in. min gage, W bulldozer, cable-op, tilting; W back ripper teeth, pneumatic cable, front, 1 drum; WWN, reversible, rear, 1 drum, International Harvester model TD-24.	249	140	101	243	2,038	27.6	50.9
69	-----	Tractor, full-tracked, low-speed, diesel-eng driven, hv DBP, 74-in. min gage, W bulldozer, cable-op, tilting, outside track frame, power con unit, cable-op, front, 1 drum; WWN, reversible, rear, 1 drum.	237	136	95	224	1,772	21.2	44.3
70	-----	Tractor, full-tracked, low-speed, diesel-eng driven, hv DBP, 74-in. min gage, mil spec T-12229, size 5, W bulldozer, cable-op, tilting, outside track frame, pneumatic cable, front, 1 drum; WWN, reversible, rear, 1 drum, Caterpillar model D-8.	241	136	90	228	1,707	24.1	42.6
71	-----	Tractor, full-tracked, low-speed, diesel-eng driven, med DBP, 74-in. min gage, W angledozer, cable-op, front, 1 drum, power con unit, cable op, rear,	202	113	95	159	1,255	19.8	31.1

		2 drums, SAE mounting features, convertible to hyd-op.							
72		Tractor, full-tracked, low-speed, diesel-eng driven, med DBP, 74-in. min gage, W bulldozer, cable-op, rigid outside track frame, power con unit, cable-op, rear, 2 drums.	205	116	87	165	1,197	14.8	29.9
73		Tractor, full-tracked, low-speed, diesel-eng driven, med DBP, 74-in. min gage, W angledozer, cable-op, W pneumatic cable, front, 1 drum, rear, 2 drums.	168	117	113	137	1,285	16.0	32.1
74		Tractor, wheeled, ind, gas-eng driven 5,200-7,775-lb DBP.	108	66	75	49	310	3.0	7.8
75		Tractor, wheeled, ind, diesel-eng driven, 14,025-20,000-lb DBP.	194	96	115	129	1,239	12.7	30.9
76		Tractor, wheeled, ind, diesel-eng driven, 20,025-27,000-lb DBP.	221	136	106	285	1,850	15.7	46.1
77		Tlr, bolster, 2½-ton, 1 swivel bolster	189	90	42.5	118	419	1.1	10.5
78		Tlr, bolster, 2½-ton, 2 stationary bolsters inf raft and/or pneumatic brg eqp.	189	90	65	118	640	1.1	16.0
79		Tlr, bolster, 2½-ton, 2 stationary bolsters triangulation tower.	214	79	65	117	636	1.5	15.9
80		Tlr, util, 2½-ton, 2-wheel	83	74	45	43	160	1.2	4.0
81		Tlr, clamshell bucket, 3-ton	171	108	49	128	524	1.8	13.1
82		Tlr, low-bed, 8-ton	288	100	55	200	918	4.8	22.9
83		Tlr, flat-bed, 10-ton, for crane-shovel attachments	333	98	60	227	1,135	5.6	28.3
84		Tlr, low-bed, 60-ton	495	134	76	461	2,916	16.0	72.9
85		Tlr-tractor, dump, diesel-eng driven, 13 cu yd	445	115	129	356	3,820	16.0	95.8
86		Trk, bolster, body 2½-ton, 6 x 6, WWN	268	87	96	162	1,291	5.7	32.4
87		Trk, stake, 5-ton, WWN (mil bridging)	369	114	114	292	2,765	13.4	69.4
88		Welding eqp, set nr 1, elec arc, tlr-mtd	143	72	69	72	412	1.8	10.3
89	Electric light	Genr set, elec, ptbl, diesel-eng driven, skid-mtd, 120-208/240-416 v, 60 cy, 15 kw.	84	30	57	17	83	1.6	2.1
90		Genr set, elec, ptbl, diesel-eng driven, skid-mtd, 120-208/240-416 v, 60 cy, 30 kw.	108	36	69	27	156	2.5	3.9
91		Genr set, elec, ptbl, diesel-eng driven, skid-mtd, 120-208/240-416 v, 60 cy, 45 kw.	87	36	59	22	107	2.2	2.7
92		Genr set, elec, ptbl, diesel-eng driven, skid-mtd, 120-208/240-416 v, 60 cy, 60 kw.	120	36	76	30	191	2.8	4.8
93		Genr set, elec, ptbl, diesel-eng driven, skid-mtd, AC, 120-208/240-416 v, 60 cy, 100 kw.	192	62	92		634		15.9
94		Genr set, elec, ptbl, diesel-eng driven, skid-mtd, 120-208/240-416 v, 400 cy, 30 kw.	110	36	76	28	176	2.5	4.4
95		Genr set, elec, ptbl, diesel-eng driven, skid-mtd, 120-208/240-416 v, 400 cy, 45 kw.	87	36	59	22	107	2.2	2.7

See footnotes at end of table.

1	Class	Type or model	3	4	5	6	7	8	9
			Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
			(Dimensions—in)						
96	Electric light—continued	Genr set, ptbl, gas-eng driven, skid-mtd, AC 120 v, 1 and 3 ph, 120-240 v, 1 ph, 120-208 v, 3 ph, 60 cy, 10 kw.	64	28	42	12	42	0.7	1.1
97		Genr set, ptbl, gas-eng driven, skid-mtd, AC, 120 v, 1 ph, 60 cy, 15 kw.	84	30	57	17.5	83	1.6	2.1
98		Light set, gen illumination, set No. 3, 3 kw.	90	36	38	23	71	1.0	1.8
99		Light set, gen illumination, set No. 4, 5 kw.	120	48	56	40	187	1.5	4.7
100		Light set, gen illumination, set No. 5, 15 kw.						5.5	23.5
101	Ferry	Const outfit, raft, set No. 1, inf spt.						4.8	20.3
102		Ferry conversion set, raft, inf spt.						1.5	7.8
103	Firefighting equipment	Firefighting eqp set, W tlr, MG	162	80	77	90	577	3.2	14.5
104		Firefighting eqp set, W trk, GM	336	96	108	224	2,020	18.5	50.4
105		Firefighting eqp set, W trk, set No. 18, 500 GPM	270	96	111	180	1,667	11.3	41.6
106		Firefighting eqp set, W trk, set No. 21, Army acct crash.	294	96	106	196	1,740	10.5	44.0
107	Plant	Crushing, screening, and washing plant, 50 tons/hr.	480	124	144	414	4,960	32.0	124.0
108		Dryer, agg, tlr-mtd, 30 tons/hr max.	246	108	127	185	1,960	6.0	48.8
		Air sep tlr.	420	98	138	280	3,280	22.0	82.0
		Air source tlr (2 ea)	366	96	134	240	2,640	25.5	66.0
		Heat exch tlr.	420	98	138	280	3,280	24.0	82.0
109		Mixer, bituminous, tlr-mtd, 10-30 tons/hr.	180	102	120	128	1,275	5.5	31.9
110		Powerplant, nuclear, fxd, 2,000 kw, elec. ^{6 7}						640.0	
111		Solidifying plant, liq carbon-dioxide to dry ice, stlr-mtd, Electrical Heating Equipment Company model SC02.	312	96	138	208	2,288	16.0	57.2
112	Shop equipment	Shop eqp, contact maint, trk-mtd	214	83	89	123	914	2.5	22.9
113		Shop eqp, elec rep, stlr-mtd, set No. 4	324	97	129	218	2,342	11.8	58.7
114		Shop eqp, GP, hv, stlr-mtd, set No. 1	307	96	112	204	1,905	11.3	47.8
115		Shop eqp, org rep, lt, trk-mtd, set No. 2	318	94	129	208	2,228	11.0	55.8
116		Shop eqp, welding, set No. 8	80	42	41	23	80	3.9	2.0
117		Woodworking shop eqp, base maint, set No. 1	145	72	46	72	278	1.9	6.9
118	Topographic equipment	Drafting eqp set (photomapping co topo bn)					1,940	13.8	
119		Map distr set, dep.					3,615	29.0	
120		Map distr set, ptbl.					230	2.2	
121		Photomapping eqp, set No. 1 (topo bn, fld army)					1,970	15.1	44.4
122		Photomapping eqp, set No. 3 (topo co, corps)					261	2.2	6.5
123		Photoprinting and proc topo repro set, trk-mtd, set No. 3.	327	96	132	218	2,400	10.5	60.0
124		Repro eqp, topo, mtz, camera sec, set No. 7	327	96	132	218	2,400	11.6	60.0
125		Repro eqp, topo, mtz, lab sec, set No. 3	327	96	132	218	2,400	9.2	60.0
126		Repro eqp, topo, mtz, map layout sec, set No. 2	327	96	132	218	2,400	10.7	60.0

127		Repro eqp, topo, mtz, plate grainer sec, set No. 3	327	96	132	218	2,400	10.2	60.0
128		Repro eqp, topo, mtz, plate proc sec, set No. 3	327	96	132	218	2,400	9.5	60.0
129		Repro eqp, topo, mtz, press sec, set No. 7	327	96	132	218	2,400	11.6	60.0
130		Sv eqp, set No. 15 (topo co, corps)					385.7	2.6	
131		Tower erection set, topo, W tower						7.5	11.4
132	Water purification equipment	Water purification eqp set, tlr-mtd, 600 GPH	173	91	84	109	760	2.9	19.0
133		Water purification eqp set, diatomite filter, ptbl, set No. 3, 35 GPM.	171	75	67	89	498	3.6	12.3
134		Water purification eqp set, diatomite filter, ptbl, set No. 4, 50 GPM.	24	24	48	4	16	2.9	0.4
135	Miscellaneous	Conversion and stor unit, carbon-dioxide, stlr-mtd, Cardox Corp model FE-34365.	324	98	126	270	2,160	8.5	54.0
136		Fire and salv eqp, marine, set No. 1						22.7	65.8
137		Genr, acetylene, stlr-mtd, Sight Feed model TM CP-750.	354	99	133	244	2,684	11.0	66.8
138		Genr, carbon-dioxide, stlr-mtd, Girdler model 32-4027.	420	110	138	306	3,690	24.0	92.0
139		Genr, oxy-nitrogen, stlr-mtd, Air Products model A-2.	264	96	144	176	2,112	12.5	52.8
140		Intrenching eqp, set No. 2						2.3	6.3
141		Pneumatic tool and compressor outfit, tlr-mtd, 210 CFM.				73	467	2.9	
142		Pneumatic tool outfit, 315 CFM						1.2	3.2
143		Water cooling tower, stlr-mtd, Badger model CT-1	348	96	135	232	2,552	9.0	63.7

¹ Items exceeding 1 short ton, uncrated.

² Dimensions shown in columns 3, 4, and 5 are the maximum length, width, and height in inches of fully assembled equipment in travel position.

³ Weights of vehicles shown in column 8 are for vehicles not loaded.

⁴ Measurement tons represent the volume of the fully assembled item; i.e., the product of columns 3, 4, and 5 in cubic feet divided by 40.

⁵ For classified data, see FM 101-10-3, paragraph 5-8.

⁶ Capacity can be divided between electric power and heat; i.e., 1,800 kw electrical plus 3,600 kw equivalent of heat.

⁷ Essential powerplant components and building can be transported in 46 C-124 aircraft (2,100 miles range). The following materials are assumed to be available at the site—foundation materials, concrete aggregate, and earth suitable for shielding.

5-7. Medical Service Unit Assemblages^{1,2}

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Construction combination and TOE No.	Major medical equipment set and Federal stock number	Medical equipment set(s) ³						Other technical service equipment ¹						Total unit TOE assemblage ¹					
			No. of lines	No. of packages	Short tons	Cube	Car-loads	Sq ft of storage space	No. of lines	No. of packages	Short tons	Cube	Car-loads	Sq ft of storage space	Total No. of lines	Total No. of packages	Total short tons	Total cube	Total car-loads	Total sq ft of storage space
2	SGT----- 8-500C	Gen disp, CommZ, type I----- 6545-925-2700	656	98	4.6	565	LCL	56	233	51	2.0	218	LCL	27	889	149	6.6	783	LCL	83
3	SGV----- 8-500C	Gen disp, CommZ, type II----- 6545-925-2800	596	170	6.6	852	LCL	85	84	45	2.0	90	LCL	11	680	215	8.6	942	LCL	96
4	SHH----- 8-500C	Disp, CommZ----- 6545-925-9010	388	65	2.4	349	LCL	35												
5	SGU ⁴ ----- 8-510D	Fld hosp hospitali- zation unit, mbl----- 6545-543-6730	902	472	17.5	2,529	1	253												
6	SGE ⁵ ----- 8-563E	Sta hosp, 100-bed, CommZ----- 6545-955-1830	1,882	478	32.2	4,417	2	450	388	397	22.8	3,023	1	320	2,220	875	55.0	7,440	3	770
7	SG3 ⁵ ----- 8-564D	Sta hosp, 200-bed, CommZ----- (1 ea 6545-955- 1830 and 6545- 925-5330)	1,950	790	46.6	6,401	3	760	235	810	25.9	3,328	1	400	2,185	1,600	72.5	9,729	4	1,160
8	SG4 ⁵ ----- 8-565E	Sta hosp, 300-bed, CommZ----- (1 ea 6545-925- 5310 50-bed exp, CommZ) (1 ea 6545-955- 1850 250-bed hosp, CommZ)	2,608	1,130	60.1	8,514	4	860	290	387	45.9	6,502	2	3,036	2,898	1,517	106.0	15,016	6	3,896
9	SGC ⁵ ----- 8-566E	Sta hosp, 500-bed, CommZ----- 6545-955-1880	2,550	1,735	82.5	12,468	6	1,260	483	1,282	99.6	12,185	6	1,660	3,033	3,017	182.1	24,653	12	2,920
10	SGB ⁵ ----- 8-567D	Sta hosp, 750-bed, CommZ----- 6545-955-1910	2,778	2,271	127.6	23,252	9	2,350	512	1,852	110.6	12,803	6	1,750	3,290	4,123	238.2	36,055	15	4,100
11	SGA ⁵ ----- 8-551R	Gen hosp, 1,000- bed, CommZ----- 6545-925-3950	2,887	3,709	233.9	34,123	15	3,440	335	2,105	125.0	13,638	6	1,800	3,222	5,814	358.9	47,761	21	5,240

AGO 6169A	12	SGL ⁵ ----- 8-563E	Hosp exp, 25-bed, CommZ----- 6545-925-5300	399		4.0	543	LCL	60											
	13	SGK ⁵ ----- 8-563E	Hosp exp, 50-bed, CommZ----- 6545-925-5310	408	171	7.6	1,099	LCL	112											
	14	SGJ ⁵ ----- 8-564D	Hosp exp, 100-bed, CommZ----- 6545-925-5330	463	279	14.3	2,097	1	300											
	15	SGI ⁵ -----	Hosp exp, 250-bed, CommZ----- 6545-925-5350	445	658	31.3	4,927	2	500											
	16	SGH-----	Hosp exp, 500-bed, CommZ----- 6545-925-5370	457	1,175	61.3	10,599	4	1,080											
	17	SAJ----- 8-571D	Mbl army surg hosp, 60-bed----- 6545-931-4850	1,167	406	16.0	2,358	1	185	165	514	26.3	2,985	1	300	1,332	920	42.3	5,343	2 485
	18	SGN----- 8-581D	Evac hosp, smbl, 400-bed----- 6545-919-5800	2,631	975	41.8	6,602	13	665	249	1,052	72.2	8,221	3	1,040	2,880	2,027	114.0	14,823	16 1,705
	19	SGQ ⁵ ----- 8-590D	Conv cen, army, exp 1,500 patients----- 6545-914-4285	507	481	21.4	2,604	1	265	170	2,706	138.2	12,612	6	1,500	1,002	4,881	159.6	15,216	7 1,765
	20	SHB ⁵ ----- 8-590D	Conv cen, army, 1,500 patients----- 6545-914-4295	970	814	32.1	4,463	2	450	495	4,400	260.0	31,400	13	4,000	1,140	3,520	292.1	35,863	15 4,450
	21	SSJ----- 8-650D	Med lab, army----- 6545-664-0358	3,132	852	20.4	3,603	1	365											
	22	SSH ⁴ ----- 8-650D	Med lab, ptbl, army----- 6545-543-4111	1,848	249	9.0	1,329	1	144											

¹ Exclude vehicles and minimum essential equipment (AR 220-10).

² These data represent the unit assemblage components as packaged by the Army Medical Service depot for oversea shipment.

³ Includes only materiel items organic to the medical equipment set as published in

the appropriate DA supply document pertaining to the Federal stock nr specified in column 2.

⁴ Multiply by 3 for complete fld hosp.

⁵ No current documentation available; estimated, based on previous documentation.

5-8. Items of Ordnance Equipment^{1,2,3}

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measure- ment tons
			(Dimensions—in)						
2	ADA missile system, HAWK.	Launcher, GM/HAWK.....	175	96	92	117	900	2.1	22.5
3	ADA missile system, NIKE-AJAX.	Launcher-loader, GM/NIKE-AJAX.....	243	79	57	133	635	1.8	15.9
4	ADA missile system, NIKE-HERCULES.	Launcher-loader, GM/NIKE-HERCULES.....	275	97	38	185	587	6.3	14.7
5	Bulldozer.....	Bulldozer, earthmoving, tractor mounting, M5.....		130	35	31	189	2.0	-----
6	-----	Bulldozer, earthmoving, tk mounting, M8.....		146	36	36	240	4.4	-----
7	Dolly.....	Dolly, tlr converter, 6-ton, 2-wheel, M197A1.....	112	93	52	72	313	1.5	7.8
8	-----	Dolly, tlr converter, 8-ton, 2-wheel, M198A1.....	119	97	56	80	374	1.7	9.3
9	-----	Dolly, tlr converter, 18-ton, 4-wheel, M199.....	150	115	58	80	587	4.0	9.3
10	HONEST JOHN rocket system.	Handling unit, 762-mm rkt, tlr-mtd, M405.....	321	97	130	216	1,408	4.3	35.2
11	-----	Launcher, 762-mm rkt, trk-mtd, M386.....	389	114	105	308	2,677	16.8	67.0
12	-----	Launcher, 762-mm rkt, XM33.....	346	94	54	226	1,016	2.3	25.4
13	-----	Tlr, 762-mm rkt, 4-wheel, XM465.....	316	83	61	184	936	2.2	3.4
14	Rifle.....	Rifle, 106-mm, on mount, M79.....	135	32	44	30	110	0.2	2.8
				(base arms closed)					
15	Semi-trailer.....	Stlr, cgo van, 6-ton, 2-wheel, M119.....	264	90	78	165	2,026	3.6	43.0
16	-----	Stlr, shop van, 6-ton, 2-wheel, M146.....	276	95	136	182	2,064	3.8	51.6
17	-----	Stlr, stake, 6-ton, 2-wheel, M118.....	276	95	103	182	1,563	3.1	39.0
18	-----	Stlr, cgo, 12-ton, 4-wheel, M127A1.....	344	97	106	231	2,100	6.8	51.2
19	-----	Stlr, sup van, 12-ton, 4-wheel, M129.....	346	98	143	235	2,806	7.7	70.1
20	-----	Stlr, low-bed, 15-ton, 4-wheel, M172.....	406	115	64	324	1,729	7.8	43.2
21	-----	Stlr, tk, gas, 5,000-gal, 4-wheel M131A2.....	361	96	106	241	2,292	6.4	53.1
22	-----	Stlr, tk transporter, 50-ton, 8-wheel, M15A2.....	473	150	68	492	3,490	21.3	69.7
23	-----	Tlr, cgo, 1/4-ton, 2-wheel, M100.....	109	56	42	42	148	0.2	3.7
24	-----	Tlr, cgo, 3/4-ton, 2-wheel, M101.....	147	73	83	75	520	0.7	13.0
25	-----	Tlr, tk, water, 400-gal, 2-wheel, M149.....	157	80	73	94	572	1.3	14.3
26	Tracked vehicle.....	Carrier, cgo, amph, full-tracked, M29.....	126	66	71	58	219	1.8	8.5
27	-----	Carrier, cgo, amph, full-tracked M29C.....	192	67	71	90	403	2.3	13.2
28	-----	Carrier, cgo, amph, full-tracked, M76.....	215	98	103	146	1,180	6.1	31.4
29	-----	Carrier, pers, full-tracked, armd, M59.....	215	129	88	198	1,670	19.4	36.3
30	-----	Carrier, pers, full-tracked, armd, M113.....	189	106	87	139	1,008	11.2	-----
31	-----	Gun, twin 40-mm, SP, full-tracked, M42A1.....	244	129	111	218	1,900	21.5	47.5
32	-----	Gun, 90-mm, SP full-tracked, M56 (abn).....	242	98	87	165	1,026	6.5	29.9

33	Gun, 175-mm, SP, full-tracked, M107	444	124	136	387	3,600	31.1	108.3
34	Howitzer, 105-mm, SP, full-tracked, M52A1	215	128	134	191	1,890	25.1	53.6
35	Howitzer, 105-mm, SP, full-tracked, M108	240	129	124	215	1,897	23.1	55.5
36	Howitzer, 155-mm, SP, full-tracked, M44A1	240	128	122	214	2,240	27.5	54.6
37	Howitzer, 155-mm, SP, full-tracked, M109	261	129	124	234	1,897	26.5	60.4
38	Howitzer, 8-in., SP, full-tracked, M55	325	140	140	316	2,101	48.0	92.7
39	Howitzer, 8-in., SP, full-tracked, M110	294	124	115	253	2,320	29.3	60.6
40	Mortar, 4.2-in., SP, full-tracked, M84	215	129	88	198	1,670	19.4	36.3
41	Tk, cmbt, full-tracked, lt gun, M41A3	264	130	111	238	2,205	25.4	56.9
42	Tk, cmbt, full-tracked, med gun, M48A2	289	146	115	293	2,982	49.5	68.4
43	Tk, cmbt, full-tracked, med gun, M60	328	143	118	326	3,203	42.7	79.5
44	Tk, cmbt, full-tracked, 120-mm gun, M103A1	398	146	127	405	4,290	62.8	104.0
45	Tk recovery vehicle, hv, M51	399	143	129	396	4,260	49.3	106.4
46	Tk recovery vehicle, med, M74	330	122	133	279	2,611	44.3	76.9
47	Tk recovery vehicle, med, M88	318	135	120	298	2,700	54.4	74.5
48	Tractor, full-tracked, high-speed, M8A2	265	131	120	242	2,418	19.3	60.3
49	Tractor, full-tracked, high-speed, 23-ton, M85	239	119	129	197	1,735	16.9	53.1
50	Tractor, full-tracked, high-speed, 38-ton M6	258	121	104	217	2,166	30.0	45.5
51	Weapon (towed) Gun, 280-mm, hv mtz, M65	1,010	124	146	871	10,590	76.0	264.5
52	Howitzer, 105-mm, M2A2 (carriage, M2A2)	236	82	66	135	302	3.3	18.5
53	Howitzer, 155-mm, M1A1 (carriage, M1A2)	288	96	81	191	834	8.7	32.4
54	Howitzer, 8-in., M2A1 (carriage, M1)	480	99	103	330	2,683	16.8	70.8
55	Launcher, multiple rkt, 4.5-in., M21	179	80	57	99	470	0.8	11.8
56	Wheeled vehicle (less trailer). Automobile, sedan, lt.	197	74	66	101	557	1.7	14.0
57	Automobile, sedan, med	207	76	63	109	575	1.8	14.4
58	Carrier, lt wpn, inf, 1/2-ton, 4 x 4, M274	104	47	28	32	77	0.4	2.0
59	Trk, amb, frontline, 1/4-ton, 4 x 4, M170	155	61	57	136	407	1.5	6.6
60	Trk, util, 1/4-ton, 4 x 4, M38A1	139	61	57	60	274	1.3	6.6
61	Trk, util, 1/4-ton, 4 x 4, M151	132	63	71	58	245	1.2	8.5
62	Trk, 3/4-ton, 6 x 6, XM408	162	62	72	72	432	1.2	10.8
63	Trk, amb, fld, 3/4-ton, 4 x 4, M43	198	74	92	102	813	3.6	19.7
64	Trk, ego, 3/4-ton, 4 x 4, M37	189	74	90	97	497	3.0	18.4
65	Trk, wkr, 3/4-ton, 6 x 6, XM408	186	63	73	81	496	1.6	12.4
66	Trk, amph, 2 1/2-ton, 6 x 6, M147E2	382	104	115	271	2,483	9.6	66.0
67	Trk, ego, 2 1/2-ton, 6 x 6, M34	275	88	109	168	1,094	6.0	38.0
68	Trk, ego, 2 1/2-ton, 6 x 6, M211	269	96	112	179	1,270	6.8	41.8
69	Trk, ego, 2 1/2-ton, 6 x 6, XLBW, M41	294	97	111	198	1,830	9.9	45.7
70	Trk, crane, 2 1/2-ton, 6 x 6, M108	303	96	99	200	1,655	9.9	41.7
71	Trk, dump, 2 1/2-ton, 6 x 6, M342	273	96	101	182	1,244	7.7	38.3
72	Trk, lt wkr, 2 1/2-ton, 6 x 6, M60	302	96	107	201	1,787	11.9	44.9
73	Trk, shop van, 2 1/2-ton, 6 x 6, M220	269	96	130	179	1,943	7.5	48.6
74	Trk, shop van, 2 1/2-ton, 6 x 6, M292	329	98	133	224	2,482	9.7	62.5
75	Trk, tk, gas, 2 1/2-ton, 6 x 6, M217	267	96	109	178	1,335	7.1	40.4
76	Trk, tk, water, 2 1/2-ton, 6 x 6, M222	267	96	103	178	1,335	7.2	38.2

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
			(Dimensions—in)						
77	Wheeled vehicle (less trailer)(continued).	Trk, tractor, 2½-ton, 6 x 6, M48.....	240	93	82	155	1,118	5.9	28.0
78	-----	Trk, tractor, 2½-ton, 6 x 6, M221.....	232	96	102	155	1,015	6.0	32.9
79	-----	Trk, ego, 5-ton, 6 x 6, M41.....	311	98	111	212	1,958	9.9	48.9
80	-----	Trk, dump, 5-ton, 6 x 6, M51.....	282	97	111	190	1,318	11.0	43.9
81	-----	Trk, med wkr, 5-ton, 6 x 6, M62.....	348	97	128	233	1,919	16.7	62.1
82	-----	Trk, tractor, 5-ton, 6 x 6, M52.....	257	96	102	173	1,245	9.2	36.8
83	-----	Trk, tractor, wkr, 5-ton, 6 x 6, M246.....	352	98	132	240	2,635	16.4	65.9
84	-----	Trk, ego-prime mover, 10-ton, 6 x 6, M125.....	334	115	130	266	1,911	18.0	72.2
85	-----	Trk, tractor, 10-ton, 6 x 6, M123.....	380	114	112	222	2,068	14.5	51.7
86	-----	Trk, gun-lifting, hv, 4 x 4, front, M249.....	368	124	120	317	3,170	16.6	79.1
87	-----	Trk, gun-lifting, hv, 4 x 4, rear, M250.....	369	124	120	318	3,313	17.7	79.3

¹ Items exceeding 1 short ton, uncrated.

² Weights shown in column 8 for combat vehicles, except half-tracks, are fighting (loaded) weights. Those for half-tracks and noncombat vehicles are weights of vehicles not loaded.

³ For classified data pertaining to nuclear weapons systems, See FM 101-10-3, chapter 5.

5-9. Items of Quartermaster Equipment^{1,2}

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
			(Dimensions—in)						
2	Crane.....	Crane trk, whs, sluing boom, gas, front-wheel drive, pneumatic tires, 10,000-lb cap.	295	94	95	199	1,584	10.4	39.6
3	Semi-trailer.....	Petr lab, mbl.....	300	96	118	200	1,968	9.5	49.2
4		Stlr, refrg, 7½-ton 2-wheel, lt-weight.....	246	83	129	142	1,525	3.2	38.5
5	Tractor.....	Tractor, wheeled, whs, gas, 4 pneumatic-tired wheels, 4,000-lb cap. 12	110	65.5	56	54	258	2.4	6.5
6	Trailer.....	Bath unit, fld, mbl.....	151	72	68	76	428	2.1	10.6
7		Bath unit, fld, ptbl, 8-showerhead, M58.....	77	39.5	46	22	82	0.4	2.1
8		Bkry unit, mbl, M1945:							
9		Genr set, gas-eng driven, wheel-mtd, 30 kw.....	150	71	96	74	592	2.4	14.8
10		Mixing and makeup machinery tlr.....	197	88	111	121	1,113	5.5	27.8
11		Oven tlr.....	200	88	83	122	847	3.3	21.1
12		Ldry unit, mbl, two-trl type, M1955:							
13		Tumbler tlr.....	164	84	90	96	716	2.5	17.9
14		Washer tlr.....	164	84	84	96	670	2.5	16.7
15		Rclm and maint:							
16		Clo rep tlr.....	108	67	66	50	276	2.2	6.9
17		Shoe rep tlr.....	108	67	66	50	276	2.4	6.9
18		Textile rep tlr.....	108	67	66	50	276	2.2	6.9
19		Tlr, platform, whs, wood, 6,000-lb cap., pneumatic tires, 48 x 108 in.	108	48	21	36	76	0.5	1.2
20	Truck.....	Trk, lift, fork, gas, 2,000-lb, solid rubber tires, 130-in. lift.	69	33	83	16	126	2.3	3.1
21		Trk, lift, fork, gas, 4,000-lb, solid rubber tires 100-in lift.	77.8	41	91	22	174	3.4	4.4
22		Trk, lift, fork, gas, 6,000-lb, pneumatic tires, 168-in. lift.	113	68	115	55	552	5.2	13.8
23		Trk, lift, fork, gas, 6,000-lb pneumatic tires, rough terrain.	204	86	91	122	868	8.5	21.7
24		Trk, lift, fork, gas, 10,000-lb, pneumatic tires, 210-in. lift.	136	77	150	78	976	7.1	24.4
25		Trk, lift, fork, gas, 10,000-lb, 4 steerable drive wheels, pneumatic tires, rough terrain.	240	103	100	172	-----	13.7	35.9
26		Trk, lift, fork, gas, 15,000-lb, pneumatic tires, 210-in. lift.	152	96	150	101	1,356	9.2	33.9

¹ Items exceeding 1 short ton, uncrated.

² Weights of vehicles shown in column 8 are weights of vehicles not loaded.

5-10. Items of Communications-Electronics Equipment

Dimensions and weights data pertaining to items of COMMEL equipment are published in section IV, FM 24-19.

5-11. Items of Transportation Equipment^{1,2}

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measure- ment tons
			(Dimensions—in)						
2	Air:								
2	Airplane ³	O-1A, fxd-wing, lt obsn	300.00	47.00	90.00	100	750	1.00	⁴ 18.00
3		U-6A, fxd-wing, util	363.60	52.00	124.80	131	1,651	1.60	⁴ 32.00
4		U-8D, fxd-wing, util transport	378.00	195.00	135.60	513	5,857	2.00	⁴ 145.00
5		U-1A, fxd-wing, transport	501.60	140.00	151.20	489	6,162		⁴ 151.00
6		OV-1, fxd-wing, observation	492.00	110.00	152.00				
7		CV-2, fxd-wing, cargo	871.00	278.00	381.00				
8	Helicopter ³	OH-13, rotary-wing, obsn	382.00	114.00	113.00	303	2,922	1.00	⁴ 73.00
9		UH-19, rotary-wing, util	548.00	139.00	110.00	545	3,590	2.70	⁴ 175.00
10		CH-21, rotary-wing, lt transport	631.00	168.00	189.00	761	12,170	3.70	⁴ 290.00
11		OH-23, rotary-wing, obsn	338.00	92.00	128.00	216	2,300	1.00	⁴ 51.00
12		CH-34, rotary-wing, lt transport	530.00	144.00	170.00	480	6,880	3.60	⁴ 188.00
13		CH-37, rotary-wing, med transport	668.00	328.00	180.00	1,520	22,910	9.90	⁴ 577.00
14		UH-1, rotary-wing, util	474.00	97.20	175.20				
15		CH-47, rotary-wing, cargo	612.00	149.00	222.00				
16	Marine:								
16	Barge	Deck cgo, nonpropelled, steel, 81-ft, design 7001, sectionalized, nesting.	972.00	264.00	84.00	1,782	12,474	64.40	311.90
17		Deck cgo, nonpropelled, steel, 570-ton 110-ft, design 7005. ⁵	1,320.00	384.00		3,520		134.40	
18		Deck cgo, nonpropelled, steel, 585-ton, 120-ft, design 231-A. ⁵	1,440.00	396.00	126.00	3,960	41,580	196.00	1,039.50
19		Deck or liq cgo, nonpropelled, steel, design 218-E (knocked down).	545.00	216.00	54.00	818	3,681	14.50	92.00
20		Deck or liq cgo, nonpropelled, steel, 578-ton or 4,160-bbl, 120-ft, design 231-B (knocked down). ⁵	1,440.00	396.00		3,960		196.00	
21		Liq cgo, nonpropelled, steel, 235-ft, design 7004. ⁵	2,820.00	480.00	⁶ 141.00	9,400	110,450	392.00	2,761.30
22		Refrigerated cgo, nonpropelled, steel, 14,200-cu ft, 120-ft, design 7010. ⁵	1,440.00	396.00	⁶ 120.00	3,960	39,600	257.60	990.00
23		Rep shop, fltg, marine eqp, nonpropelled, steel 210-ft, design 7011. ⁵	2,525.00	480.00		8,424		1,300.00	
24	Boat	Passenger and cgo, diesel, steel, 65-ft design 2001	786.00	212.00	252.00	1,158	24,318	74.00	608.00
25		Picket, diesel, steel, 46-ft, design 4003	556.00	147.00	156.00	568	7,384	11.00	184.60
26		Picket, diesel, wood, 36-ft 6-in., design 243-B	438.00	127.00	112.00	386	3,602	6.80	90.10
27		Picket, diesel, wood, 64-ft 11-in., design 4002	779.00	191.00	192.00	1,032	16,512	34.70	412.80
28		Util, diesel, plastic, 26-ft, design 6009	318.00	97.00	⁶ 69.00	214	1,231	3.40	30.80

29	Crane-----	Barge, diesel-elec, revolving, steel, 60 long tons, design 413-D. ⁵	1,704.00	696.00	-----	8,236	-----	1,120.00	-----
30	-----	Barge, diesel-elec, revolving, steel, 89 long tons, design 264-B. ⁶	1,680.00	840.00	-----	9,800	-----	15,688.00	-----
31	Landing craft-----	Mechanized, diesel, steel, Mark VI, Navy design LCM(6).	672.00	168.00	160.00	784	10,192	31.40	254.80
32	-----	Mechanized, diesel, steel, Mark VIII, Navy design LCM(8).	884.00	252.00	164.00	1,550	21,090	67.20	527.30
33	-----	Util, diesel, steel, Navy design LCU, 1466 class, sectionalized.	1,380.00	408.00	261.00	3,910	85,043	201.60	2,126.10
34	Lighter-----	Lighter amph (LARC-60), 60-ton, design 2303----	751.00	319.00	249.00	1,658	34,404	97.50	860.10
35	-----	Lighter amph (LARC-15), 15-ton, design 8004----	540.00	174.00	164.00	653	8,927	22.60	223.20
36	-----	Lighter amph (LARC-5) 5-ton, design 8005----	420.00	120.00	122.00	350	3,556	10.50	88.90
37	Ponton-----	Sectional, curved end, steel, 7' x 7' x 5' 1/2", Mark T-7A, W connectors.	84.00	84.00	61.00	49	245	1.40	6.12
38	-----	Sectional, end ramp, steel, 5' 1/2" x 7' x 3' 6", Mark T-11, W connectors.	61.00	84.00	42.00	35	123	0.90	3.10
39	-----	Sectional, intmed ramp, steel, 5' 1/2" x 7' x 4' 11 3/8", Mark T-8, W connectors.	61.00	84.00	60.00	35	175	1.10	4.40
40	-----	Sectional, rectangular, steel, 7' x 5' 1/2" x 5' 1/2", Mark T-6B, W connectors.	84.00	61.00	61.00	35	175	1.00	4.40
41	Tug-----	Harbor, diesel, 200 HP, steel, 45-ft, design 320----	543.00	150.00	180.00	565	8,475	28.20	211.90
42	-----	Harbor, diesel, 600 HP, steel, 65-ft, design 3004----	840.00	234.00	273.00	1,365	30,054	112.00	751.40
43	-----	Harbor, diesel, 1,200 HP, steel, 100-ft, design 3006. ⁷	1,284.00	318.00	-----	2,840	-----	320.50	-----
44	-----	Oceangoing, diesel-elec, 1,530 HP, steel, 143-ft, design 377-A. ⁷	1,721.00	396.00	-----	4,736	-----	623.00	-----
45	Vessel-----	Sup, diesel, steel, 176-ft, design 381. ⁷ -----	2,118.00	384.00	-----	5,648	-----	510.80	-----
46	-----	Liq cgo, diesel, steel, 182-ft, design 294-A. ⁷ -----	2,190.00	360.00	204.00	5,475	93,075	533.00	2,326.90
47	-----	Lighter, beach discharge, deck cgo, diesel, steel 338-ft, design 5002. ⁷	4,506.00	780.00	1,038.00	21,970	(⁷)	1,733.76	(⁷)
Rail:									
48	Locomotive, diesel-elec (36 39 3/8-42-in.).	48-ton, 0-4-4-0 road switcher-----	420.00	102.00	136.00	298	3,380	58.00	84.30
49	Locomotive, diesel-elec (56 1/2-60-63-66-in.).	60-ton, 0-4-4-0 road switcher-----	420.00	102.00	136.00	298	3,380	58.00	84.30
50	Locomotive, diesel-elec (36-39 3/8 42-in.).	80-ton, 0-6-6-0 road switcher-----	504.00	108.00	131.00	378	4,130	72.00	103.20
51	Locomotive, diesel-elec (56 1/2-60-63-66-in.).	120-ton, 0-6-6-0 road switcher-----	642.00	116.00	163.00	518	3,380	116.20	175.60
52	Locomotive, steam (36-39 3/8-42-in.).	60-ton, 2-8-2 road-----	428.50	102.38	136.00	304	3,465	52.00	89.30
		Tender-----	285.00	102.38	136.00	202	2,285	20.80	57.50
53	Locomotive, steam (56 1/2-60-63-66-in.).	82-ton, 2-8-0 road-----	393.50	116.00	163.00	321	4,330	74.00	107.00
		Tender-----	286.00	116.00	163.00	234	3,158	23.20	77.80

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	sq ft	Cu ft	Short tons	Measure- ment tons
			(Dimensions—in)						
54	Railway car (36-39½-42-in.).	Amb, ki—diner—stor.....	734.25	100.00	133.56	509	5,650	45.00	140.40
55	-----	Amb, pers.....	734.25	100.00	133.56	509	5,650	45.50	140.40
56	-----	Amb, ward.....	734.25	100.00	133.56	509	5,650	46.00	140.40
57	-----	Box, 30-ton.....	458.25	95.38	128.75	302	3,230	13.60	450.60
58	-----	Flat, 30-ton.....	458.25	95.38	44.00	302	1,110	11.00	420.60
59	-----	Gondola, high side, 30-ton.....	458.25	95.38	92.00	302	2,315	13.30	427.50
60	-----	Gondola, low side, 30-ton.....	458.25	95.38	62.00	302	1,560	12.10	424.00
61	-----	Tk, 6,000-gal.....	419.75	95.38	145.00	278	3,350	17.50	84.00
62	Railway car (56½-60-63-66-in.).	Amb, ki—diner—stor.....	794.00	114.00	157.00	628	8,220	54.70	179.30
63	-----	Amb, pers.....	794.00	114.00	157.00	628	8,220	54.20	179.30
64	-----	Amb, ward.....	794.00	114.00	157.00	628	8,220	55.20	179.30
65	-----	Box, 40-ton.....	530.75	114.00	139.44	420	4,885	18.00	459.00
66	-----	Flat, 40-ton.....	530.75	114.00	56.06	420	1,631	14.40	424.00
67	-----	Flat, depressed cen, 70-ton ⁸	492.00	116.00	40.00	396	1,334	38.00	433.10
68	-----	Flat, 80-ton.....	603.50	116.00	52.13	486	2,104	35.50	427.60
69	-----	Gondola, high side, 40-ton.....	530.75	114.00	104.06	420	3,640	17.70	432.10
70	-----	Gondola, low side, 40-ton.....	530.75	114.00	74.06	420	2,582	15.20	428.00
71	-----	Refrg, 40-ton.....	530.75	114.00	139.44	420	4,885	19.00	459.00
72	-----	Tk, 10,000-gal.....	505.50	114.00	157.81	399	5,240	20.00	140.50
	Miscellaneous:								
73	Cgo transporter.....	Box, metal, shipping, steel, 295-cu ft cap., max load 9,000-lb.	102.00	75.00	82.50	53	366	0.75	9.10
74	Liq transporter.....	Transporter, liq, rolling-wheel type, 1,000-gal, T-3.	140.50	98.00	64.00	96	509	1.20	12.80

¹ Items exceeding 1 short ton, uncrated.

² Weights of vehicles shown in column 8 are weights of vehicles not loaded.

³ Slight variation in specifications of different models; e.g., U-8D, U-8F, etc.

⁴ Knocked down.

⁵ May be towed to destination.

⁶ Indicated height does not include equipment above deck.

⁷ Self-deliverable.

⁸ Car is not designed to operate on 63-inch gage.

5-12. Items of Construction and Fortification Materials¹*a. Engineer.*

1	1	2	3
	Item	Short tons	Measurement tons
2	Asphalt/km (7.3 m wide, 7.62 cm thick)-----	55.80	74.40
3	Cement, portland -----	1.00	0.53
4	Explosive (military dynamite) ² -----	1.00	1.05
5	Detonating cord, 3,000'/box (100 boxes) ² -----	3.85	6.30
6	Time fuze, blasting (100 boxes) ² -----	4.70	9.80
7	Track 98 lb/m, rail/km of single track -----	98.27	29.76
8	Track, rail turnout, complete 98 lb/m, ea -----	5.95	4.15
9	Sandbags, per 100,000 -----	16.50	100.00
10	Gravel, pit run, loose -----	2.10	1.00
11	Rock, crushed, loose -----	2.00	1.00
12	Pipe, 4", w/couplings (1 km) -----	16.93	-----
13	Pipe, 6", lt, w/couplings (1 km) -----	25.67	-----
14	Pipe, 6", hvy, w/couplings (1 km) -----	32.18	-----
15	Pipe, 8" lt, w/couplings (1 km) -----	38.44	-----
16	Pipe, 8", hvy w/couplings (1 km) -----	48.54	-----
17	Pipe, 12", w/couplings (1 km) -----	70.80	-----
18	Pipe, 16" (welded) (1 km) -----	856.84	-----
19	Tank, steel, bolted, 10,000-barrel -----	44.10	71.00

¹ Items exceeding 1 short ton, uncrated.² Ordnance item.*b. Signal.*

1	1	2	3
	Type or model	Short tons	Measurement tons
2	Wire, WD-1 ()/TT, on spool, DR-S () ----- 1320 ft (402.3 m), 14 lbs --	.007	-----
3	Wire, WD-1 ()/TT, on dispenser, MX-306 ()/G ----- 2640 ft (804.6 m), 26 lbs --	.013	-----
4	Wire, WD-1 ()/TT, on reel, RL-159 ()/U ----- 1 mi (1.6 km), 66 lbs -----	.033	-----
5	Wire, WD-1 ()/TT, on reel, DR-5 ----- 2½ mi (4 km), 154 lbs -----	.077	-----
6	(Wire, WD-1 ()/TT alone weighs 48 lbs per mile (1.6 km)). -----	.024	-----
7	100-mi (160.9 km) requirements (Spiral-4 cable) without poles -----	26.5	39.0
8	Same with poles -----	187.5	282.0
9	300 mi (482.7 km) open wire, crossarms, hardware, etc., without poles -----	527.0	502.0
10	Same with poles -----	3067.0	3842.0
11	100 mi (160.9 km) tactical radio (radio relay with carrier equipment) -----	42.0	104.0

Section IV. CLASS III SUPPLY

5-13. Liquid Fuel and Lubricant Data

a. Vehicles.

1	2	3	4	5	6
Vehicle	Vehicle fuel tank capacity (gal)	Fuel per 100 miles/160 km (gal)	Oil per 100 miles/160 km (gal)	Gear lubricant per 100 miles/160 km (lb)	Miscellaneous greases per 100 mi/160 km (lb)
2 Automobile, sedan, hv.....	20.0	7.0	0.2	0.1	0.1
3 Automobile, sedan, lt.....	16.0	5.8	0.2	0.1	0.1
4 Automobile, sedan, med.....	17.0	6.0	0.2	0.1	0.1
5 Carrier, cgo, amph, full-tracked, M29.....	35.0	20.0	1.5	0.8	0.5
6 Carrier, cgo, amph, full-tracked, M29C ²	35.0	23.0	1.5	1.0	0.5
7 Carrier, cgo, amph, full-tracked, M76.....	60.0	30.0	2.2	0.8	1.5
8 Carrier, lt wpn, inf, ½-ton, 4 x 4, M274.....	8.0	6.7	0.2	0.2	0.2
9 Carrier, pers, full-tracked, armd, M59.....	130.0	100.0	2.0	-----	2.0
10 Carrier, pers, full-tracked, armd, M113.....	80.0	40.0	-----	-----	-----
11 Gun, twin 40-mm, SP, full-tracked, M42A1.....	140.0	117.0	4.0	1.5	2.0
12 Gun, 90-mm, SP, full-tracked, M56 (abn).....	55.0	20.0	2.2	0.8	1.5
13 Howitzer, 105-mm, SP, full-tracked, M52A1.....	176.0	166.0	4.1	1.5	2.5
14 Howitzer, 155-mm, SP, full-tracked, M44A1.....	150.0	166.0	3.9	1.5	2.5
15 Howitzer, 8-in, SP, full-tracked, M55.....	350.0	234.0	4.0	1.7	2.8
16 Landing vehicle, wheeled, 2½-ton, 6 x 6.....	40.0	16.7	0.6	0.9	0.3
17 Mortar, 4.2-in, SP, full-tracked, M84.....	130.0	130.0	2.0	-----	2.0
18 Motorcycle, solo.....	3.5	2.4	0.2	0.1	0.1
19 Motorscooter.....	2.0	2.0	0.2	0.1	0.1
20 Shop eqp, contact maint, trk-mtd.....	50.0	20.0	0.4	0.8	0.4
21 Shop eqp, mtz, GP.....	45.0	20.0	0.4	0.8	0.4
22 Shop, rep, SigC, 2½-ton, 6 x 6, trk-mtd.....	50.0	20.0	0.4	0.8	0.4
23 Tk, cmbt, full-tracked, lt gun, M41A3.....	140.0	83.3	3.7	1.5	1.5
24 Tk, cmbt, full-tracked, med gun, M48A2.....	330.0	246.0	5.1	2.0	1.0
25 Tk, cmbt, full-tracked, med gun, M60.....	375.0	140.0	0.7	-----	-----
26 Tk, cmbt, full-tracked, 120-mm gun, M103A1.....	280.0	350.0	5.2	1.5	2.5
27 Tk recovery vehicle, hv, M51.....	385.0	296.0	4.1	2.0	2.5
28 Tractor, full-tracked, high-speed, M8A2.....	225.0	104.0	3.8	1.5	3.0
29 Tractor, full-tracked, high-speed, 13-ton, M5.....	80.0	53.0	2.0	1.5	2.0
30 Tractor, full-tracked, high-speed, 18-ton, M4.....	125.0	125.0	2.1	1.5	2.0
31 Tractor, full-tracked, high-speed, 38-ton, M6.....	300.0	330.0	2.8	1.5	2.0
32 Trk, amb, frontline, ¼-ton, 4 x 4.....	20.0	7.1	0.3	0.1	0.2
33 Trk, util, ¼-ton, 4 x 4.....	17.0	7.1	0.2	0.2	0.2
34 Trk, ¾-ton, 6 x 6, XM408.....	17.0	6.9	0.1	0.1	0.3
35 Trk, cgo, ¾-ton, 4 x 4.....	24.0	12.0	0.2	0.3	0.3
36 Trk, wkr, ¾-ton, 6 x 6, XM408.....	17.0	6.9	0.1	0.1	0.3
37 Trk, cgo, 2½-ton, 6 x 6, M34.....	50.0	20.0	0.4	0.8	0.4
38 Trk, cgo, 2½-ton, 6 x 6, M35.....	50.0	20.0	0.4	0.8	0.4
39 Trk, cgo, 2½-ton, 6 x 6, XLWB, M41.....	50.0	20.0	0.4	0.8	0.4
40 Trk, cgo, 2½-ton, 6 x 6, M135.....	56.0	22.2	-----	-----	-----
41 Trk, cgo, 2½-ton, 6 x 6, M211.....	56.0	17.2	-----	-----	-----
42 Trk, crane, 2½-ton, 6 x 6, M108.....	50.0	14.3	0.7	0.7	0.5
43 Trk, dump, 2½-ton, 6 x 6, LWB, M47.....	50.0	20.0	0.4	0.8	0.4
44 Trk, lt wkr, 2½-ton, 6 x 6, M60.....	50.0	20.0	0.4	0.8	0.4
45 Carrier, comd and recon, M114.....	110.0	36.9	-----	-----	-----
46 Recovery veh full-tracked, M578.....	300.0	66.6	-----	-----	-----
47 Tk recovery veh medium, M88.....	445.0	200.0	-----	-----	-----
48 Launcher, M60 series Tk chassis for AVLB.....	375.0	100.0	-----	-----	-----

See footnotes at end of table.

1	2	3	4	5	6
Vehicle	Vehicle fuel tank capacity (gal)	Fuel per 100 miles/160 km (gal)	Oil per 100 miles/160 km (gal)	Gear lubricant per 100 miles/160 km (lb)	Miscellaneous greases per 100 mi/160 km (lb)
49 Carrier, comd post, lt tracked, M577	120.0	40.0			
50 Trk, shop van, 2½-ton, 6 x 6, WVN	56.0	20.0	0.4	0.8	0.4
51 Trk, tk, gas, 2½-ton, 6 x 6, M217	56.0	20.0	0.4	0.8	0.4
52 Trk, tractor, 2½-ton, 6 x 6, M221	56.0	22.2	0.4	0.8	0.4
53 Trk, tractor, 2½-ton, 6 x 6, M275	50.0	18.0	0.4	0.8	0.4
54 Trk, cgo, 5-ton, 6 x 6, M41	78.0	32.3	0.6	0.9	0.8
55 Trk, cgo, 5-ton, 6 x 6, M54	78.0	32.3	0.8	0.4	0.5
56 Trk, med wkr, 5-ton, 6 x 6, M62	78.0	37.0	0.8	0.4	0.5
57 Trk, tractor, 5-ton, 6 x 6, M52	110.0	34.0	0.6	0.9	0.8
58 Trk, tractor, wkr, 5-ton, 6 x 6, M246	78.0	22.5	0.4	0.8	0.4
59 Trk, cgo-prime mover, 10-ton, 6 x 6, M125	150.0	50.0	0.8	0.8	1.0
60 Trk, tractor, 10-ton, 6 x 6, M123	150.0	350.0	0.8	0.8	1.0
61 Trk, tractor, 12-ton, 6 x 6, M26A1 (tk transporter)	120.0	100.0	1.5	0.9	1.1
62 Trk, gun-lifting, hv, 4 x 4, front, M249	140.0	100.0			
63 Trk, gun-lifting, hv, 4 x 4, rear, M250	140.0	100.0			

¹ For arctic winter operations increase amounts by 25 percent.

² In water the Weasel, M29C, uses 2½ gal of fuel per hour.

³ Unless used with M15A1, modified stlr for transporting M48 tank.

b. Construction Equipment.

1	2	3
Type	Type of fuel	Estimated average rate of consumption in gal per hour
2 Air conditioner, tlr-mtd, gas-eng driven, 26,500 Btu/hr	Gasoline	0.50
3 Boat, brg erection, gas-eng driven, aluminum, 19-ft long	Gasoline	9.00
4 Boat, brg erection, gas-eng driven, aluminum, 27-ft long	Gasoline	18.00
5 Boiler, steam, high-pressure, 12 HP	Oil	4.00
6 Compressor, air, reciprocating, tlr-mtd, diesel-eng driven, 210 CFM	Diesel	8.00
7 Compressor, air, reciprocating, trk-mtd, gas-eng driven, 210 CFM	Gasoline	5.00
8 Compressor, air, reciprocating, trk-mtd, W gas power unit, 80 CFM, air-cooled	Gasoline	8.50
9 Compressor, air, reciprocating, wheel-mtd, gas-eng driven, 600 CFM	Gasoline	1.30
10 Crane-shovel, power unit, abn, 7½-ton, ½ cu yd	Gasoline	---
11 Crane-shovel, trk-mtd, gas-eng driven, 2-ton cap	Gasoline	1.70
12 Crane-shovel, trk-mtd, gas-eng driven, 10-ton cap., ½ cu yd	Gasoline	3.00
13 Crane-shovel, trk-mtd, gas-eng driven, 20-ton cap., ¾ cu yd	Gasoline	3.50
14 Crane, nonrevolving, tractor-op, diesel-eng driven, 40,000-lb cap	Diesel	7.00
15 Grader, road, mtz, diesel-eng driven, 12-ft blade	Diesel	8.00
16 Grader, road, mtz, diesel-eng driven, 8,975-lb pressure at blade, 10-ft blade	Diesel	5.00
17 Grader, road, mtz, diesel-eng driven, 8,000-12,000-lb DBP	Diesel	8.00
18 Grader, road, mtz, diesel-eng driven, tandem, 12,500-14,475-lb DBP, 12-ft	Diesel	---
19 Grader, road, mtz, diesel-eng driven, 12,000-17,000-lb DBP	Diesel	8.00
20 Loader, scoop-type, diesel-eng driven, 4-wheel, 1½ cu yd	Diesel	3.00
21 Roller, road, gas-eng driven, 2-axle tandem, 5- to 8-ton	Gasoline	3.50
22 Roller, road, gas-eng driven, 3-wheel, 10-ton	Gasoline	3.50
23 Tractor, full-tracked, low-speed, diesel-eng driven, W armd cab	Diesel	5.00
24 Tractor, full-tracked, low-speed, diesel-eng driven, med DBP	Diesel	10.00
25 Tractor, full-tracked, low-speed, diesel-eng driven, 8,600-12,000-lb DBP	Diesel	9.00
26 Tractor, full-tracked, low-speed, diesel-eng driven, 12,100-17,000-lb DBP	Diesel	15.00
27 Tractor, full-tracked, low-speed, diesel-eng driven, 17,100-21,000-lb DBP, W angledozer	Diesel	10.00

	1	2	3
1	Type	Type of fuel	Estimated average rate of consumption in gal per hour
28	Tractor, full-tracked, low-speed, diesel-eng driven, 24,100-32,000-lb DBP, W bulldozer.....	Diesel	11.00
29	Tractor, saw power unit, wheelbarrow-type, 2-wheel, pneumatic tires, gas-eng driven, 22 HP.....	Gasoline	1.50
30	Tractor, wheeled, ind, gas-eng driven, 3,700-4,000-lb DBP.....	Gasoline	4.00
31	Tractor, wheeled, whs, gas, 4 pneumatic-tired wheels, 4,000-lb cap.....	Gasoline	0.75
32	Trk, lift, fork, gas, 2,000-lb, solid rubber tires.....	Gasoline	0.57
33	Trk, lift, fork, gas, 4,000-lb, pneumatic tires.....	Gasoline	0.58
34	Trk, lift, fork, gas, 4,000-lb, solid rubber tires.....	Gasoline	0.58
35	Trk, lift, fork, gas, 6,000-lb, pneumatic tires.....	Gasoline	0.91
36	Trk, lift, fork, gas, 6,000-lb, pneumatic tires, rough terrain.....	Gasoline	3.50
37	Trk, lift, fork, gas, 6,000-lb, solid rubber tires.....	Gasoline	0.91
38	Trk, lift, fork, gas, 10,000-lb, pneumatic tires, rough terrain.....	Gasoline	5.00
39	Trk, lift, fork, gas, 15,000-lb, pneumatic tires, rough terrain.....	Gasoline	8.20

¹ Normal daily operation of equipment will be 20 hours per day, with 4 hours set aside for maintenance.

c. Army Aircraft.

	1	2	3	4	5	6
1	Model	Grade of fuel ⁵	Fuel capacity internal (lbs/gal) ¹	Fuel consumption per hour cruise speed (lbs/gal) ^{1 2}	Type engine oil ⁴	Engine oil consumption (gal/hr) ²
2	Bird Dog O-1A.....	115/145	252/42	54/9	(2) (3)	.5
3	Otter U-1A.....	115/145	1281/213.5	198/33	(2)	1.5
4	Beaver U-6A.....	115/145	828/138	138/23	(2)	1.0
5	Seminole U-8D/F.....	115/145	1380/230	204/34	(3)	.5
6	Mohawk OV-1A.....	JP-4	1930/297	741/114	(1)	.37
7	Caribou CV-2B.....	115/145	4968/828	702/117	(2)	3.5
8	Sioux OH-13H.....	115/145	258/43	84/14	(2) (3)	.75
9	Raven OH-23D.....	115/145	276/46	90-102/15-17	(2) (3)	.75
10	Iroquois UH-1B.....	JP-4	1008/155	371/57	(1)	.37
11	UH-1D.....	JP-4	1430/220	476/73	(1)	.37
12	Chickasaw UH-19D.....	115/145	1050/175	270/45	(2)	2.5
13	Shawnee CH-21C.....	115/145	1800/300	522/87	(1) (2) (3)	3.0
14	Choctaw CH-34A.....	115/145	1572/262	516/86	(2)	2.0
15	Mojave CH-37A.....	115/145	2388/398	1344/224	(2)	5.0
16	Chinook CH-47B.....	JP-4	4095/630	1573/242	(1)	.37

¹ Conversion factor 6.0 lbs per gal AV gal/6.5 lbs per gal JP-4.

² Fuel and oil consumptions vary appreciably in individual aircraft, climatic conditions and gross weight. Consumption figures should only be used in computing general requirements data.

³ Oil grades change depending on temperature. See specific instructions for each powerplant or transmission.

⁴ Type engine oil: (1) MIL-L-7808 (for free turbine engines)

(2) MIL-L-6082 Grade 1100

(3) MIL-L-6082 Grade 1065

⁵ Fuels specified for use under combat conditions. For CONUS and peacetime operations, see TMs of 55 series on individual aircraft.

*d. Locomotives.**(1) Fuel oil (oil-burning steam locomotives).*

	1	2	3	4
1	Type of locomotive	Type of operation	Estimated average rate of fuel oil consumption	
			Pounds/train-mile	Pounds/hour
2	2-8-0 standard gage..	Road	55	450
3	2-8-2 narrow gage..	Road	60	500

(2) Diesel oil. (diesel-electric locomotives).

	1	2	3	4
1	Type of locomotive	Type of operation	Estimated average rate of diesel oil consumption	
			Gal/train-mile in road service	Gal/hour in switching service
	<i>Standard gage:</i>			
2	0-4-4-0, diesel-elec, 60-ton -----	Road switcher -----	0.9	4.0
3	0-6-6-0, diesel-elec, 120-ton -----	Road switcher -----	2.5	7.5
	<i>Narrow gage:</i>			
4	0-4-4-0, diesel-elec, 48-ton -----	Road switcher -----	0.9	4.0
5	0-6-6-0, diesel-elec, 80-ton -----	Road switcher -----	1.5	6.0

In estimating fuel requirements, it is recommended that 5 percent be added to computed rate of consumption to allow for contingencies.

(3) *Lubricants.* Estimated lubricating oil and grease requirements for motive power and rolling stock—1,000 pounds per month for each train per day (moving in either direction) for each division.

(4) *Switch engines.* For general planning purposes, assume operation of switch engines for 20 hours per day. Allow 4 hours per day for maintenance.

e. Marine.

	1	2	3
1	Type	Type of fuel	Estimated average rate of consumption in gal per hour
2	Barge, inland waterways, SP, diesel, steel, 55-ft, design 3011 -----	Diesel	19.0
3	Barge, liq cgo, SP, diesel, steel, 6,500-bbl, 182-ft, design 294-A -----	Diesel	40.0
4	Boat, acft rescue, gas, wood, 85-ft, design 379 -----	Gasoline	153.0 (main) 14.0 (aux)
5	Boat, passenger and cgo, diesel, steel, 65-ft, design 2001 -----	Diesel	15.0
6	Boat, picket, diesel, steel, 46-ft, design 4003 -----	Diesel	19.0
7	Boat, picket, diesel, wood, 36-ft 6-in, design 234-B -----	Diesel	10.0
8	Boat, picket, diesel, wood, 63-ft, design 4002 -----	Diesel	23.0
9	Boat, util, diesel, plastic, 26-ft, design 6009 -----	Diesel	3.5
10	Crane, barge, diesel-elec, revolving, steel, 60 long tons, design 413-D -----	Diesel	16.0
11	Crane, barge, diesel-elec, revolving, steel, 89 long tons, design 264-B -----	Diesel	22.0
12	Landing craft, mechanized, diesel, steel, Mark VI, Navy design LCM(6) -----	Diesel	24.0
13	Landing craft, mechanized, diesel, steel, Mark VIII, Navy design LCM(8) -----	Diesel	34.0
14	Landing craft, util, diesel, steel, Navy design LCU, 1466 class, sectionalized -----	Diesel	28.0

	1	2	3
1	Type	Type of fuel	Estimated average rate of consumption in gal per hour
15	Landing craft, vehicle, pers, diesel, wood, 36-ft, Navy design LCVP -----	Diesel	12.0
16	Lighter, amph (BARC), SP, diesel, steel, 60-ton, 61-ft, design 2303 -----	Diesel	38.0
17	Propelling unit, marine, outboard, diesel, 165 HP, design 9002 -----	Diesel	10.0
18	Trk, amph, 2½-ton, 6x6 -----	Gasoline	8.0
19	Tug, harbor, diesel, 200 HP, steel, 45-ft, design 320 -----	Diesel	10.0
20	Tug, harbor, diesel, 600 HP, steel, 65-ft, design 3004 -----	Diesel	34.0
21	Tug, harbor, diesel, 1,200 HP, steel, 100-ft, design 3006 -----	Diesel	68.0
22	Tug, oceangoing, diesel-elec, 1,530 HP, steel, design 377-A -----	Diesel	86.0
23	Vessel, liq cgo, diesel, steel, 11,500-bbl, 210-ft, design 7014 -----	Diesel	80.0
24	Vessel, sup, diesel, steel, 176-ft, design 381 -----	Diesel	57.0

¹ The fuel consumption for diesel-powered floating equipment has been determined by the following formula:

$$\text{Hourly fuel (diesel) consumption} = \frac{\text{Rated HP} \times 0.41 \text{ (lb)}}{7.2 \text{ (lb per gal (diesel))}}$$

f. Power Units.

	1	2	3
1	Type	Type of fuel	Estimated average rate of consumption in gal per hour
2	Power unit PE-49 (.715 kw) -----	Gasoline	.15
3	Power unit PE-95 () (10 kw) -----	Gasoline	1.10
4	Power unit PE-214 () (300 watts) -----	Gasoline & Oil	.133
5	Gen set, diesel eng, trl mtd PU-407/M (45 kw) -----	Diesel	3.38
6	Gen set, trk mtd, 45 kw, diesel eng PU-408/M (45 kw) -----	Diesel	3.38
7	Gen set, gas eng PE-75 (2.5 kw) -----	Gasoline	0.65
8	Gen set, gas eng PE-210 (450 watts) -----	Gasoline & Oil	0.133
9	Gen set, gas eng PU-26 ()/U (12.5 kw) -----	Gasoline	2.2
10	Gen set, gas eng PU-107/U (12.5 kw) -----	Gasoline	2.15
11	Gen set, gas eng PU-286/G (5 kw) -----	Gasoline	3.20
12	Gen set, gas eng PU-450/G (3 kw) -----	Gasoline	1.2
13	Gen set, gas eng, trl mtd PU-248/U (includes one ea PE-95 ()) -----	Gasoline	1.10
14	Gen set, gas eng, trl mtd PU-253/U (includes 2 ea PU-107/U) -----	Gasoline	2.15
15	Gen set, gas eng, trl mtd PU-256 ()/U (includes one ea PE-95 ()) -----	Gasoline	1.10
16	Gen set, gas eng, trl mtd PU-290/MR (includes one ea PU-248/U) -----	Gasoline	1.10
17	Gen set, gas eng, trl mtd PU-294/G (includes 2 ea PU-286/G) -----	Gasoline	3.20
18	Gen set, gas eng, trl mtd PU-322/G (includes 2 ea PE-75) -----	Gasoline	0.65
19	Gen set, gas eng, trl mtd PU-332/G (includes one ea PE-95 ()) -----	Gasoline	1.10
20	Gen set, gas eng, trl mtd PU-378/G (includes 2 ea PU-26A/U) -----	Gasoline	2.2
21	Gen set, gas eng, trl mtd PU-456/G (includes 2 ea PU-286/G) -----	Gasoline	3.20
22	Gen set, gas eng, trl mtd PU-474/M (includes 2 ea 10 kw gen sets) -----	Gasoline	3.22

g. Miscellaneous.

	1	2	3
1	Type	Type of fuel	Estimated average rate of consumption in gal per hour
2	Conversion and stor unit, carbon-dioxide, stlr-mtd -----	Gasoline	2.10
	Genr and chg plant, liq-oxy and nitrogen, stlr-mtd:		
3	Air Products model A-2 ¹ -----	Diesel	12.00
4	Air Products model LON-5 -----	Diesel	38.00
5	Air Products model LEON-20 -----	Diesel	140.00
6	Heater, duct-type, ptbl, gas, 250,000 Btu -----	Gasoline	2.00 to 4.00
7	Ldry unit, tlr-mtd, gas-eng driven -----	Gasoline	10.80
8	Refrg unit, mech, gas-eng, driven -----	Gasoline	0.90 to 1.25

¹ Power source for A-2 plant is a 100-kw generator.**5-14. Bulk Petroleum Distribution**

	1	2
1	Type of carrier	Amount carried
	Barges:	
2	Deck or liq cgo, nonpropelled, steel -----	9,000 to 175,000 gal ¹
3	Liq cgo, nonpropelled, steel -----	546,000 gal ²
4	Liq cgo, SP, diesel, steel -----	273,000 gal ³
	Pipelines:	
		Normal capacity: ⁴ (bbl per day)
5	4-in ⁵ -----	7,100 -----
6	6-in -----	15,700 -----
7	8-in -----	27,100 -----
8	12-in -----	143,000 -----
		Emergency capacity: ⁴ (bbl per day)
		7,900 -----
9	Railroad tk cars, petrol -----	8,000; 10,000; 12,000 gal
10	36", 39", 42" gage, foreign svc -----	6,000 gal
11	56½" gage, domestic svc, riveted or welded -----	10,000 gal
12	56½", 60", 63", 66" gage, foreign svc -----	10,000 gal
13	Ships (supertanker) -----	262 to 870 thousand bbl
14	Ships (large tanker) -----	60 to 262 thousand bbl ⁶
15	Ships (small tanker) -----	14 to 48 thousand bbl ⁷
	Storage tanks:	
16	Bolted steel -----	100; 250; 500; 1,000; 3,000 10,000 bbl
17	Collapsible, fabric, ptbl -----	900; 3,000; 10,000 gal
18	Liq stor, metal, for POL, horizontal, W skids -----	600 gal
19	SUPPT assemblage, bulk petrol products -----	60,000 gal
20	Tk, liq dispensing, tlr-mtd -----	600 gal
21	Transporter, liq, rolling-wheel type -----	1,000 gal
22	Trk, tk, fuel svc, 2½-ton, 6x6 -----	1,200 gal
23	Trk, tractor, 5-ton, 6x6, SWB, WWN, W stlr, tk, ----- gas, 5,000-gal, 4-wheel.	5,000 gal
24	Vessel, liq cgo, SP, diesel, steel, 210-ft, design 7014 -----	483,000 gal

¹ Rectangular hulls.² 6 x 18 ponton barge, carrying three 42,000-gal tanks loaded to two-thirds capacity.³ Molded hulls.⁴ Computed on an average operating day of 20 hr.⁵ Nominal size.⁶ The ship tanker most commonly used is the T2-SE-A1, a 5,922,000-gal tanker. It is 524 ft long and draws 81 ft. It has three 8-in flanged discharge outlets and four discharge pumps rated 1,000 GPM at 100 psi.⁷ Draft loaded, 12 to 20 ft.

5-15. Weights, Volumes, and Conversion Factors for Petroleum Products*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Product	Packaging	Wt (lb)	Cubic ft		Conversion factors		Gal per short ton	Gal per long ton	Gal ¹ per measurement ton	Bbl ¹ per long ton	Pack-ages per short ton	Pack-ages per long ton	Pack-ages per measurement ton	Capacity of vehicles for carrying filled containers ²		
				Actual	Plan-ning factor	Gal to lb	Lb to gal								1½-ton trailer	2½-ton truck	5-ton truck
2	Aviation gasoline	Bulk				5.90	0.169	339.0	379.7		9.04						
		55-gal drums ³	373.0	9.03	11	6.91	0.145	289.4	324.2	187.8		5.36	6.00	3.48	8	14	28
		55-gal drums ⁴	389.0	8.80	11	7.20	0.139	277.8	311.1	192.8		5.14	5.76	3.57	8	13	26
		55-gal drums ⁵	364.0	9.20	11	6.90	0.145	289.9	324.6	181.2		5.49	6.15	3.42	9	14	28
		5-gal cans ⁶	40.5	0.81	1	8.00	0.125	250.0	280.0	200.0		49.40	55.30	40.00	74	124	248
3	Jet fuel (JP-4)	Bulk				6.42	0.156	312.0	349.4		8.058						
		55-gal drums ³	399.0	9.03	11	7.39	0.135	270.0	302.4	187.8		5.01	5.61	3.48	8	13	25
		55-gal drums ⁴	415.0	8.80	11	7.68	0.130	260.0	291.2	192.7		4.82	5.40	3.57	8	12	24
		55-gal drums ⁵	392.0	9.20	11	7.40	0.135	270.0	302.4	181.2		5.10	5.71	3.42	8	14	28
4	Motor gasoline	Bulk				6.11	0.164	327.3	366.6		8.73						
		55-gal drums ³	384.0	9.03	11	7.11	0.141	281.2	315.1	187.8		5.21	5.83	3.48	8	13	26
		55-gal drums ⁴	400.0	8.80	11	7.41	0.135	269.9	302.3	192.8		5.00	5.60	3.57	8	13	26
		55-gal drums ⁵	376.0	9.20	11	7.09	0.141	282.1	315.9	181.2		5.32	5.96	3.42	8	14	28
		5-gal cans ⁶	41.6	0.81	1	8.32	0.120	240.4	269.2	200.0		48.10	53.80	40.00	73	121	242
5	Diesel fuel	Bulk				6.99	0.143	286.1	320.5		7.63						
		55-gal drums ³	432.0	9.03	11	8.00	0.125	250.0	280.0	187.8		4.63	5.19	3.48	7	12	24
		55-gal drums ⁴	448.0	8.80	11	8.30	0.120	241.0	269.9	192.7		4.46	5.00	3.57	7	12	24
		55-gal drums ⁵	430.0	9.20	11	8.11	0.123	246.6	276.2	181.2		4.65	5.21	3.42	7	12	24
		5-gal cans ⁶	46.0	0.81	1	9.20	0.109	317.4	243.5	200.0		43.50	48.70	40.00	66	109	218
6	Kerosene	Bulk				6.80	0.147	294.1	329.4		7.84						
		55-gal drums ³	421.0	9.03	11	7.80	0.128	256.4	287.1	187.8		4.75	5.32	3.48	8	12	24
		55-gal drums ⁴	437.0	8.80	11	8.09	0.124	247.2	276.9	192.8		4.58	5.13	3.57	7	12	24
		55-gal drums ⁵	351.0	9.20	11	6.62	0.151	302.1	338.3	181.2		5.70	6.38	3.42	9	15	30
		5-gal cans ⁶	45.0	0.81	1	9.00	0.111	222.2	248.9	200.0		44.40	49.80	40.00	67	112	224
7	Lubricating oils	Bulk				7.60	0.132	263.2	294.7		7.02						
		55-gal drums ³	472.0	9.03	11	8.58	0.117	233.1	261.0	191.3		4.24	4.75	3.48	7	11	22
		55-gal drums ⁴	488.0	8.80	11	8.87	0.113	225.5	252.5	196.4		4.10	4.59	3.57	7	11	22
		55-gal drums ⁵	462.0	9.20	11	8.56	0.117	233.6	261.7	184.6		4.33	4.85	3.42	7	11	22
		5-gal cans ⁶	49.0	0.81	1	9.80	0.102	204.1	228.6	181.2		40.80	45.70	40.00	62	103	206
		1-qt cans (12/case).	35.0	0.88	1							58.00	64.90	40.00	86	143	286
		1-qt cans (24/ case).	60.0	1.60	2							33.40	37.30	20.00	50	84	168
		5-qt cans (6/case).	77.0	1.90	2							26.00	29.10	20.00	39	65	130

8	Greases	25-lb pails	29.0	0.95	1							69.00	77.20	40.00	104	173	346
		5-lb cans (6/case).	44.0	1.10	2							45.40	50.90	20.00	69	114	227
9	Fog oils: SGF1	Bulk				7.11	0.140	281.0	314.0		7.49						
		55-gal drums ³	438.0	9.03	11	8.11	0.123	246.6	276.2	191.3		4.50	5.02	3.48	7	11	22
		55-gal drums ⁴	588.0	8.80	11	8.40	0.110	238.0	266.6	196.4		4.32	4.84	3.57	7	11	22
		55-gal drums ⁵	421.0	9.20	11	8.10	0.123	246.9	276.5	184.6		4.57	5.12	3.42	7	11	22
10	SGF2	Bulk				6.99	0.143	286.0	320.0		7.63						
		55-gal drums ³	431.0	9.03	11	7.99	0.120	250.3	280.3	191.3		4.54	5.09	3.48	7	11	22
		55-gal drums ⁴	616.0	8.80	11	8.28	0.120	241.5	270.5	196.4		4.39	4.90	3.57	7	11	22
		55-gal drums ⁵	478.0	9.20	11	7.90	0.121	253.1	283.5	184.6		4.68	5.25	3.42	7	11	23

¹ For ocean-shipping, storage, and pipeline computations, bulk petroleum products usually are measured in bbl of 42 gal each or in long tons.

² Based on authorized loads in short tons. When overloads are authorized, these quantities may be increased to the cubic capacity of the vehicle or to 100 percent overweight, whichever limit is reached first.

³ 18-gage standard—weighs 54 lb empty—filled to 54 gal with light products, 55 gal with heavy products. Federal Specification PPP-D-729, Amendment 1.

⁴ 15-gage standard—weighs 70 lb empty—filled to 54 gal with light products, 55 gal with heavy products. Federal Specification PPP-D-729, Amendment 1.

⁵ 18-gage limited standard—weighs 52 lb empty—filled to 53 gal with light products, 54 gal with heavy products. Federal Specification PPP-D-729.

⁶ For planning purposes, weight of gasoline may be taken as 42 lb and weight of lubricating oil for engines as 50 lb per 5-gal can, including weight of can. Cans, 5-gal, weigh approximately 11 lb empty.

* Factors in this table are based on U. S. gal.

5-16. Estimating Class III Requirements

a. Estimating Solid Fuel Requirements. The factors given below are based on the use of coal only, assuming use of no petroleum products or gas. When firewood or peat is substituted, 2 pounds of such fuel is required in lieu of 1 pound of coal. Factors are applicable to temperate climate.

(1) Utilities.

Space, water heating, and cooking, per man per day	4 lb
Cooking only, per man per day	1.5 lb
Hospital use, per bed per day:	
Winter	12 lb
Summer	5 lb
Railroad engine, per km of travel on flat to hilly terrain	62 lb
Coffee roaster, per unit per day	400 lb
Laundry, fixed, per unit per day	32 short tons

(2) Steam locomotives (coal burning).

1	2	3		4
		Estimated average rate of coal consumption		
Type of locomotive	Type of operation	Pounds/train-km	Pounds/hour	
2-8-0 standard gage.	Road	55	700	
2-8-2 narrow gage --	Road	62	750	

(a) In estimating coal requirements, it is recommended that 10 percent be added to computed rate of consumption to allow for contingencies.

(b) For general planning purposes, assume operation of switch engines for 20 hours a day; allow 4 hours a day for maintenance.

b. Estimating Fuel Requirements. The major factors controlling fuel requirements in military operations are as follows:

(1) *Displacement.* By measuring the dis-

tance that the center of mass is moved, the average distance moved by each vehicle is determined. Administrative or march movements are computed on the basis of using available road nets. Movements under battle conditions are computed on the basis of selected elements of the organization proceeding cross country. Experience tables provide consumption data for moving an organization. For planning purposes, it is assumed that cross-country battle consumption is at a rate of 2.5 times that given for road movements in the fuel and oil supply data tables (para 5-17-5-24).

(2) *Supply.* During a displacement, certain vehicles of an organization must make round trip supply hauls. Since these hauls generally are made to supply points located at varying distances from the organization, an average round trip supply distance must be determined. Experience indicates that daily requirements for supply hauls are approximately equal to 10 percent of the total organizational consumption per kilometer or displacement multiplied by the average round trip supply distance. When the organization is not on the move, supply haul requirements are included in the composite requirement described in (4) below and are not computed separately.

(3) *Service.* Supplemental daily requirements exist for such purposes as movement of vehicles within bivouac areas and on reconnaissance, warming up engines, and abnormal periods of low-gear operation. These items will differ with the nature of the operation, weather, roads, and terrain and must be estimated in accordance with general conditions. Under average conditions, these requirements can be estimated by using the consumption necessary to move all vehicles in the organization 16 kilometers over roads. This factor applies

when the organization is on the march or in combat.

- (4) *Housekeeping.* Additional daily requirements exist for administrative vehicles, kitchens, gasoline-powered equipment, and maintenance and testing of engines. When the organization is not on the march, these requirements are grouped in a composite daily requirement as noted under each gasoline and oil supply data table. When the organization is on the move, the requirements for administrative vehicles (not supply hauls) and gasoline-powered equipment are absorbed by maintenance and testing factor is absorbed by the service factor; but the kitchen requirement must be added on the basis of a daily consumption per kitchen of 15 gallons of gasoline.
- (5) *Wastage.* This factor covers evaporation, spillage, and small combat losses. It is applied only to road movement in the combat zone. It is computed as 10 percent of the sum of all other consumption figures.
- (6) *Example.* An armored division (para 5-18) is to make the following movement: 1st day—145 kilometers (90 miles) in zone to bivouac area at field army rear boundary; 2d day—no movement; 3d day—97 kilometers (60 miles) forward in combat zone; and 4th day—16 kilometers (10 miles), with 13 kilometers (8 miles) under cross-country battle conditions for all elements except the division support command. Average round trip supply distances are—1st day—48 kilometers (30 miles); 2d day—32 kilometers (20 miles); 3d day—64 kilometers (40 miles); and 4th day—48 kilometers (30 miles). Estimate the diesel and gasoline requirements for the 4-day period.

Caution: Refer to notes at foot of gasoline and oil supply data tables (para 5-17—5-24) for supplemental information and data necessary to

determine complete solutions of estimated requirements.

1st day

- (a) Displacement of 145 km—
1. Diesel requirements—
Multiply 145 km by 516.5 gal per km (161 km divided into 83,152 gal from para 5-18) ----- = 74,893
 2. Gasoline requirements—
Multiply 145 km by 292.3 gal per km (161 km divided into 47,056 gal from para 5-18) ----- = 42,384
- (b) Supply requirements—
1. Multiply 48 km (supply distance) by 52.0 (10% of division diesel consumption per km) ---- = 2,496
 2. Multiply 48 km (supply distance) by 29.0 (10% of division gasoline consumption per km) ----- = 1,392
- (c) Service requirements—
1. Diesel—Multiply 10 by 516.5 to account for service requirements ----- = 5,165
 2. Gasoline—Multiply 10 by 292.3 to account for service requirements ----- = 2,923
- (d) Kitchen requirements—
Multiply 15 by 112 organic kitchen for gasoline requirements ----- = 1,680

2d day

- (e) Requirements when division is not on the march. From footnote 2, paragraph 5-18.
Gasoline ----- = 4,000

3d day

- (f) Displacement of 97 km—
1. Diesel requirements—
Multiply 97 km by 516.5 gal per km ----- = 50,101
 2. Gasoline requirements—
Multiply 97 km by 292.3 gal per km ----- = 28,353
- (g) Supply requirements—
1. Diesel — Multiply 64 km

- by 52 (10% of division consumption per km) -- = 3,328
2. Gasoline—Multiply 64 km by 29 (10% of division consumption per km) -- = 1,856
- (h) Service requirements—
1. Diesel — Multiply 10 by 516.5 ----- = 5,165
2. Gasoline—Multiply 10 by 292.3 ----- = 2,923
- (i) Kitchen requirements—
- Gasoline—Multiply 15 gal by 112 (organic kitchens) = 1,680
- (j) To account for wastage—
1. Diesel — Take 10% of (f)1 + (g)1 + (h)1 above ----- = 5,860
2. Gasoline—Take 10% of (f)2 + (g)2 + (h)2 + i above ----- = 3,313

4th day

- (k) Displacement of entire division, 16 km (with 13 km under cross-country and 3 km on roads)—
1. Diesel requirements—
- Multiply 3 km (road displacement) by 516.5 (gal per km) ----- = 1,550
2. Gasoline requirements—
- Multiply 3 km (road displacement) by 292.3 (gal per km) ----- = 877
- (l) Displacement of support command—
1. Diesel requirements —
- Multiply 13 km (road displacement) by 25.9 (gal per km) ----- = 337
2. Gasoline requirements—
- Multiply 13 km (road displacements) by 21.1 (gal per km) ----- = 274
- (m) Displacement of combat units—
1. Diesel requirements—
- Multiply 13 km (cross-country battle displacement) by 490.4 (division

- total less support command total) multiplied by 2.5 for cross-country battle factor (para 5-18 footnote 3) ----- = 15,938
2. Gasoline requirements—
- Multiply 13 km (cross-country battle displacement) by 266.2 (gal per km for division less support command) multiplied by 2.5 for cross-country battle factor --- = 8,952
- (n) Supply requirements—
1. Diesel—Multiply 30 (supply distance) by 52 (10% of division consumption per km) ----- = 1,560
2. Gasoline — Multiply 30 (supply distance) by 29 (10% of division consumption per km) ----- = 870
- (o) Service requirements—
1. Diesel — Multiply 10 by 516.5 (gal per km) ---- = 5,165
2. Gasoline—Multiply 10 by 292.3 (gal per km) ---- = 2,923
- (p) Kitchen requirements—
- Multiply 15 by 112 organic kitchen for gasoline requirements ----- = 1,680
- (q) To account for wastage—
1. Diesel — Take 10% of (k)1 + (l)1 + (n)1 + (o)1 above ----- = 861
2. Gasoline—Take 10% of (k)2 + (l)2 + (n)2 + (o)2 + (p) above ----- = 662
- (r) Total estimate for 4 days —add (a) through (q) above ----- = 279,161
or
279,165
gal

c. Per-Man-Per-Day Method of Estimating Petroleum Requirements. The per-man-per-day method of estimating petroleum requirements is used in the early planning stages when definitive information is not available on the number and types of vehicles. Because of the vari-

ables in organization composition, this method is seldom used below field army level and never below corps level; although, once established for a given theater, the figure may be used for requisitioning purposes by smaller units. It is emphasized that the gallons-per-man-per-day method is to be used as a guide only and not as a substitute for more exacting computation. The consumption in gallons-per-man-per-day in various theaters will necessarily vary with terrain, climate, ratio between land and amphibious operations, and the employment of units using special vehicles and equipment. The figures given in the following tables should be adjusted to fit each particular area as soon as experience shows any variance between these planning factors and actual usage. To compute estimated petroleum requirements, multiply troop strength by factors listed below.

(1) *Army class III supplies.*

	1	2	3
1	Product	Pounds per man per day	Gal per man per day
2	Army Ground Bulk Petroleum Fuels.	¹ 36.50	5.83
3	Mogas -----	(29.14)	(4.78)
4	Diesel -----	(7.36)	(1.05)

	1	2	3
1	Product	Pounds per man per day	Gal per man per day
5	Engine Oil ² -----	-----	-----
6	Gear Lubricants ³ -----	-----	-----
7	Grease ⁴ -----	-----	-----

¹ Data based on consumption factors, class III and III A flow chart, paragraph 5-58e (2), column 4.

² Apply factor of 8% of bulk fuel requirements to obtain engine oil requirements.

³ Same as for 2 above except apply 1% factor.

⁴ Same as for 2 above except apply 2% factor.

(2) *Army class III (A) supplies.¹*

	1	2	3
1	Product	Pounds per man per day	Gal per man per day
2	Army Aviation Bulk Petroleum Fuels.	² 4.64	0.768
3	AV-115/145 -----	³ (3.38)	(0.571)
4	JP-4 -----	(1.26)	(0.197)
5	AVLUB oils, greases and lubricants. ⁴ -----	-----	-----

¹ Air Force requirements for class III A supplies must be obtained from the appropriate Air Force command.

² Data based on consumption factors, class III and III A flow chart, paragraph 5-58e (2), column 4.

³ Types of AV GAS consolidated quantity-wise as issue of AV-80 and AV-100/180 discontinued.

⁴ Use same factors as indicated in table in (1) above.

5-17. Fuel—Airborne Division (TOE 57E)^{1, 2, 3, 4, 5, 6, 7, 8}

Unit	Fuel to move 1 km (gal)	Fuel capacity (gal)				
		Vehicle tanks gas/diesel	Gas cans	Bulk fuel	Total fuel capacity	Organic kitchens
Hq & Hq Co, Abn Div -----	2.16	976	300	-----	1,276	2
3 Hq & Hq Co, Abn Bde (ea) -----	1.81	791	225	1,700	2,716	1
9 Abn Inf Bn (ea) -----	5.80	2,533	695	1,200	4,428	4
Hq & Hq Co -----	(4.60)	(2,116)	(590)	(1,200)	(3,906)	(4)
3 Rifle Co (ea) -----	(.40)	(139)	(35)	-----	(174)	(0)
Tank Bn -----	17.35	6,536	780	3,600	10,916	4
Hq & Hq Co -----	(5.50)	(3,530)	(645)	(3,600)	(7,775)	(4)
3 Tank Co (ea) -----	(3.95)	(1,002)	(45)	-----	(1,047)	(0)
Cav Sqdn -----	7.80	6,138	1,035	10,400	17,573	4
Hq & Hq Trp -----	(3.43)	(4,475)	(425)	(3,600)	(8,500)	(4)
2 Armd Cav Trp (ea) -----	(1.70)	(565)	(245)	-----	(810)	(0)
Air Cav Trp -----	(.97)	(533)	(120)	(6,800)	(7,453)	(0)
Div Arty -----	22.48	9,737	3,165	1,500	14,402	14
Hq & Hq Btry -----	(3.16)	(1,393)	(440)	(1,500)	(3,333)	(1)
3 FA How Bn, 105-mm, Towed (ea) -----	(5.89)	(2,540)	(830)	-----	(3,370)	(4)
Hq & Hq Svc Btry -----	(2.50)	(1,187)	(335)	-----	(1,522)	(1)
3 FA How Btry, 105-mm, Towed (ea) -----	(1.13)	(451)	(165)	-----	(616)	(1)
FA Btry LJ -----	(1.65)	(724)	(235)	-----	(959)	(1)
MP Co -----	1.34	539	185	-----	724	0

Unit	Fuel to move 1 km (gal)	Fuel capacity (gal)				
		Vehicle tanks gas/diesel	Gas cans	Bulk fuel	Total fuel capacity	Organic kitchens
Avn Bn.....	4.56	2,266	580	17,000	19,846	2
Hq & Hq Det.....	(1.21)	(583)	(155)	-----	(738)	(1)
Air Mobile Co (Lt).....	(1.60)	(794)	(205)	(10,200)	(11,199)	(1)
Avn GS Co.....	(1.75)	(889)	(220)	(6,800)	(7,909)	(0)
Engr Bn.....	10.72	5,037	1,080	2,700	8,817	4
Hq & Hq Co.....	(4.06)	(1,950)	(480)	(2,700)	(5,130)	(1)
3 Engr Co (ea).....	(2.22)	(1,029)	(200)	-----	(1,229)	(1)
Sig Bn.....	5.85	2,327	860	-----	3,187	2
Hq & Hq Co.....	(.79)	(373)	(105)	-----	(478)	(2)
Comd Op Co.....	(3.06)	(1,200)	(455)	-----	(1,655)	(0)
Fwd Comm Co.....	(2.00)	(754)	(300)	-----	(1,054)	(0)
Spt Comd.....	20.44	10,305	2,710	21,700	34,715	18
Hq & Hq Co & Band.....	(.50)	(259)	(65)	-----	(324)	(1)
Admin Co.....	(1.35)	(676)	(175)	-----	(851)	(3)
Med Bn.....	(6.61)	(2,994)	(900)	(500)	(4,394)	(7)
Hq & Spt Co.....	(2.14)	(999)	(285)	(500)	(1,784)	(1)
3 Med Co (ea).....	(1.49)	(665)	(205)	-----	(870)	(2)
Sup & Trans Bn.....	(3.13)	(1,516)	(385)	(20,000)	(21,901)	(5)
Hq & Hq Det.....	(.74)	(352)	(100)	-----	(452)	(2)
Sup & Svc Co.....	(1.52)	(707)	(175)	(20,000)	(20,882)	(0)
QM Air Equip Co.....	(.87)	(457)	(110)	-----	(567)	(3)
Maint Bn.....	(8.85)	(4,860)	(1,185)	(1,200)	(7,245)	(2)
Hq & Main Spt Co.....	(3.22)	(2,149)	(485)	(1,200)	(3,834)	(1)
3 Fwd Spt Det (ea).....	(1.08)	(488)	(150)	-----	(638)	(0)
Acft Maint Co.....	(2.39)	(1,247)	(250)	-----	(1,497)	(1)
TOTAL DIV.....	150.33	69,031	17,625	72,800	159,456	89

¹ Data contained in this table are recommended for *planning purposes only*. It does not include fuel consumption of technical vehicular mounted equipment, nor that of bulldozers, scoop type loaders or forklift trucks which normally do not move on their own power in long marches.

² When div is not on the march 4000 gal of fuel are required for administrative vehicles, kitchens, and gasoline powered equipment. Daily gasoline consumption per kitchen is 15 gal (div total 1835 gal).

³ For cross-country battle conditions, fuel is multiplied by 2.5. (The 10% handling factor need not be applied when this factor is used.)

⁴ Gasoline reserve in vehicles has been computed as two 5-gal cans per truck, except for ¼T trucks which carry one 5-gal can each, and wreckers (2½ ton and 5 ton) which carry four 5-gal cans each.

⁵ Diesel fuel consumption is negligible in the abn div (.2 of 1% of total consumption). Ratio of bulk gasoline carriers to diesel carriers will be as follows:

Inf Bn—all gasoline

Tank Bn—all gasoline

Sup & Trans Bn—3 to 1

⁶ "Bulk Fuel" column represents carrying capacity of all bulk metal tankers, collapsible containers and fuel dispensing vehicles organic to division.

⁷ Table does not include consumption data for Army aircraft.

⁸ To obtain lubricating oil requirements in gallons multiply gross vehicular fuel requirements by a factor of .02.

5-18. Fuel and Oil Supply Data—Armored Division (TOE 17E)^{1, 2, 3, 4, 5, 6, 7}

1	2	3	4	5	6	7	8	9	10	11
Unit	Fuel and lubricant requirements—motor vehicles Consumption in moving veh 161 km (100 miles)					Fuel capacity (gal) gas/diesel				Organic kitchens
	Vehicle fuel (gal) Diesel	Vehicle fuel (gal) gasoline	Engine oil (gal)	Lubricant (lb)	Misc grease (lb)	Veh Tanks	Veh Cans	Bulk Tankers	Total veh tanks	
HQ & HQ co, Armd Div.....	173	301	11.2	16.3	11.3	1,749	295	-----	2,044	2
MP co.....	26	332	11.2	13.0	11.8	2,277	315	-----	2,592	0
Avn bn.....	290	375	29.8	40.2	29.3	2,554	660	-----	3,214	2
HQ & HQ det.....	(44)	(160)	(6.4)	(9.7)	(7.0)	(615)	(170)	-----	(785)	(0)
Air mobile co.....	(106)	(106)	(9.2)	(9.7)	(8.3)	(834)	(215)	-----	(1,049)	(1)
Gen spt co.....	(140)	(109)	(14.2)	(20.8)	(14.0)	(1,105)	(275)	-----	(1,380)	(1)
Sig bn.....	642	989	73.0	128.0	83.3	6,643	1,760	1,200	9,603	4
HQ & HQ det.....	(70)	(111)	(13.6)	(23.0)	(13.9)	(674)	(155)	(1,200)	(2,029)	(1)
Comd op co.....	(264)	(241)	(21.2)	(37.7)	(24.5)	(2,056)	(515)	-----	(2,571)	(1)
Fwd comm co.....	(44)	(385)	(17.0)	(29.6)	(20.4)	(2,057)	(585)	-----	(2,642)	(1)
Sig spt op co.....	(264)	(252)	(21.2)	(37.7)	(24.5)	(1,856)	(505)	-----	(2,361)	1
3 HQ & HQ co, Brigades (ea).....	229	605	10.0	12.7	10.4	2,083	260	-----	2,343	1
6 Tk bn (ea).....	7,589	2,914	100.4	44.6	50.3	29,491	665	10,200	40,356	4
HQ & HQ co.....	1,153	2,234	(55.1)	(36.5)	(41.9)	(8,716)	(560)	(10,200)	(19,476)	(4)
3 Tk co (ea).....	(2,121)	(229)	(15.1)	(2.7)	(2.8)	(6,925)	(35)	-----	(6,960)	(0)
5 ea Mech Bn.....	2,034	1,852	54.7	38.4	46.3	10,973	590	4,800	16,363	5
HQ & HQ co.....	(420)	(1,435)	(42.7)	(27.3)	(34.9)	(5,078)	(470)	(4,800)	(10,348)	(5)
3 Rifle co (ea).....	(538)	(139)	(4.0)	(3.7)	(3.8)	(1,965)	(40)	-----	(2,005)	(0)
Armd cav sqdn.....	1,350	5,787	162.0	96.0	104.0	17,354	785	10,800	28,939	5
HQ & HQ trp.....	(582)	(768)	(40.9)	(37.1)	(30.6)	(4,849)	(545)	(6,000)	(11,394)	(5)
3 Armd cav trp (ea).....	(214)	(1,656)	(38.1)	(16.2)	(22.3)	(3,908)	(25)	-----	(3,933)	(0)
Air cav trp.....	(126)	(51)	(6.8)	(10.3)	(6.5)	(781)	(165)	(4,800)	(5,746)	(0)
Engr cbt bn.....	12,854	2,193	146.3	115.5	140.3	20,525	1,525	10,800	32,850	6
HQ & HQ co.....	(600)	(1,070)	(39.9)	(37.7)	(39.4)	(4,435)	(575)	(10,800)	(15,810)	(1)
4 Cbt engr co (ea).....	(347)	(187)	(23.4)	(15.9)	(22.0)	(2,569)	(115)	-----	(2,684)	(1)
Bridge co.....	(10,866)	(375)	(12.8)	(14.2)	(12.9)	(5,814)	(490)	-----	(6,304)	(1)
Division artillery.....	9,082	8,575	437.3	353.9	331.4	46,863	6,350	19,800	73,013	24
HQ & HQ btry.....	168	422	17.2	26.3	20.4	1,925	555	2,400	4,880	1
3 FA bn, 155-mm SP (ea).....	2,234	2,042	88.0	72.7	63.5	10,468	1,375	3,600	15,443	5
HQ Btry.....	(280)	(376)	(10.6)	(11.5)	(13.0)	(1,716)	(360)	-----	(2,066)	(1)
3 FA btry, 155-mm SP (ea).....	(628)	(226)	(19.2)	(14.9)	(10.9)	(2,147)	(240)	-----	(2,387)	(1)
Svc Btry.....	(70)	(986)	(19.8)	(16.5)	(17.8)	(2,311)	(305)	(3,600)	(6,216)	(1)
FA bn, 155-mm/8" How.....	2,044	956	134.2	80.4	97.6	10,206	920	5,400	16,526	5
HQ & HQ svc co.....	(375)	(442)	(27.4)	(25.6)	(24.1)	(3,245)	(490)	(5,400)	(9,135)	(1)
3 FA Btry, 155-mm SP (ea).....	(416)	(79)	(27.8)	(13.7)	(18.8)	(1,431)	(95)	-----	(1,526)	(1)
FA Btry, 8" SP.....	(421)	(277)	(23.4)	(13.7)	(17.1)	(2,668)	(145)	-----	(2,813)	(1)
FA bn Honest John.....	168	1,071	21.9	29.1	22.9	3,328	750	1,200	5,278	3

1	2	3	4	5	6	7	8	9	10	11
Unit	Fuel and lubricant requirements—motor vehicles Consumption in moving veh 161 km (100 miles)					Fuel capacity (gal) gas/diesel				Organic kitchens
	Vehicle fuel (gal) Diesel	Vehicle fuel (gal) gasoline	Engine oil (gal)	Lubricant (lb)	Misc grease (lb)	Veh Tanks	Veh Cans	Bulk Tankers	Total veh tanks	
HQ & HQ btry	(80)	(297)	(10.3)	(13.9)	(11.3)	(1,138)	(320)	(1,200)	(2,658)	(1)
2 FA Btry HJ (ea)	(44)	(387)	(5.8)	(7.6)	(5.8)	(1,095)	(215)	-----	(1,310)	(1)
Support command	4,183	3,401	227.0	371.5	241.1	26,089	5,445	113,200	144,734	17
Hq & Hq Co & band	(44)	(103)	(5.0)	(7.8)	(5.4)	(523)	(140)	-----	(863)	(1)
Admin Co	(121)	(62)	(7.8)	(12.4)	(8.4)	(676)	(175)	-----	(851)	(3)
Medical bn	(737)	(858)	(33.6)	(56.6)	(39.8)	(4,028)	(1,160)	-----	(5,188)	(5)
HQ & HQ Spt Co	(167)	(648)	(12.6)	(21.5)	(14.3)	(1,535)	(410)	-----	(1,945)	(2)
3 Med Co (ea)	(190)	(70)	(7.0)	(11.7)	(8.5)	(831)	(250)	-----	(1,081)	(1)
Maint bn	(1,977)	(2,029)	(117.8)	(186.7)	(117.9)	(15,671)	(2,610)	(6,000)	(24,281)	(6)
HQ & HQ Co, main spt co	(652)	(836)	(39.8)	(61.4)	(41.8)	(5,570)	(865)	(1,200)	(7,635)	(2)
3 Fwd spt co (ea)	(334)	(366)	(13.8)	(24.2)	(15.5)	(2,722)	(460)	(1,200)	(4,382)	(1)
Trans acft maint co	(323)	(95)	(13.8)	(24.2)	(15.5)	(1,935)	(365)	(1,200)	(3,500)	(1)
Supply & Trans bn	(1,304)	(349)	(62.8)	(108.0)	(69.6)	(5,191)	(1,360)	(107,200)	(113,751)	(2)
HQ & HQ Co	(26)	(114)	(4.2)	(6.1)	(4.9)	(436)	(130)	-----	(566)	(2)
Sup & Svc Co	(116)	(115)	(10.0)	(17.4)	(10.6)	(785)	(180)	(107,200)	(108,165)	(0)
Trans mtr trans co	(1,162)	(120)	(48.6)	(84.5)	(54.1)	(3,970)	(1,050)	-----	(5,020)	(0)
TOTAL	83,152	47,056	2,075.7	1,615.3	1,565.0	336,025	24,855	241,000	627,969	

¹ Data contained in this table are recommended for *planning purposes only*. It does not include fuel consumption of technical vehicular mounted equipment, nor that of bulldozers, scoop type loaders or forklift trucks which normally do not move under their own power on long marches.

² When division is not on the march, 4,000 gal of fuel are required for admin vehicles, kitchens, and gasoline-powered equipment. Daily gasoline consumption per kitchen is 15 gal.

³ For cross-country battle conditions, fuel and lubricant consumption figures are multiplied by 2.5. (The 10% handling factor need not be applied when this factor is used.)

⁴ Gasoline reserve in vehicles has been computed as two 5-gal cans per truck, except for the $\frac{1}{4}$ -ton truck which carries one 5-gal can.

⁵ "Bulk fuel" column represents carrying capacity of all bulk metal tankers, collapsible containers, and fuel dispensing vehicles organic to the division and hauling vehicular fuel.

⁶ Table does not include Army aircraft fuel consumption.

⁷ This table is based on division whose Brg Co is equipped with Mobile Assault Bridging.

5-19. Fuel

a. Infantry Division (TOE7E) 1, 2, 3, 4, 5, 6, 7, 8

Unit	Fuel to move 1 km (gal)	Fuel capacity (gal)				Organic kitchens
		Vehicle tanks gas/diesel	Gas cans	Bulk fuel	Total fuel capacity	
Hq & Hq Co, Inf Div.....	2.50	1,266	315	-----	1,581	2
3 Inf Bde, Hq & Hq Co (ea).....	2.48	1,106	320	1,700	3,126	1
6 Inf Bn (ea).....	6.88	3,131	895	3,600	7,626	4
Hq & Hq Co.....	(5.26)	(2,426)	(670)	(3,600)	(6,696)	(4)
3 Rifle Co (ea).....	(.54)	(235)	(75)	-----	(310)	(0)
2 Mech Inf Bn (ea).....	30.81	11,832	450	7,200	19,482	4
Hq & Hq Co.....	(13.53)	(5,580)	(330)	(7,200)	(13,110)	(4)
3 Rifle Co (ea).....	(5.76)	(2,084)	(40)	-----	(2,124)	(0)
2 Tank Bn (ea).....	75.94	29,491	865	10,200	40,356	4
Hq & Hq Co.....	(25.24)	(8,716)	(560)	(10,200)	(19,476)	(4)
3 Tank Co (ea).....	(16.90)	(6,925)	(35)	-----	(6,960)	(0)
Cav Sqdn.....	50.95	14,836	865	12,800	28,501	5
Hq & Hq Trp.....	(10.49)	(4,813)	(545)	(6,000)	(11,358)	(5)
3 Armd Cav Trp (ea).....	(13.02)	(3,070)	(45)	-----	(3,115)	(0)
Air Cav Trp.....	(1.40)	(813)	(185)	(6,800)	(7,798)	(0)
Div Arty.....	50.53	24,716	5,695	10,100	40,511	21
Hq & Hq Btry.....	(4.21)	(1,931)	(555)	(2,900)	(5,386)	(1)
3 FA How Bn, 105-mm, Towed (ea).....	(8.49)	(4,341)	(1,080)	(1,200)	(6,621)	(4)
Hq & Hq Btry.....	(3.84)	(1,899)	(510)	(1,200)	(3,609)	(1)
3 FA How Btry, 105-mm Towed (ea).....	(1.55)	(814)	(190)	-----	(1,004)	(1)
FA How Bn, 155-mm/8-in, Towed (ea).....	(15.33)	(7,254)	(1,220)	(2,400)	(10,874)	(5)
Hq & Hq Btry.....	(5.04)	(2,396)	(500)	(2,400)	(5,296)	(1)
3 FA How Btry, 155-mm, Towed (ea).....	(2.25)	(1,127)	(170)	-----	(1,297)	(1)
FA How Btry, 8-in., Towed.....	(3.54)	(1,477)	(210)	-----	(1,687)	(1)
FA Mal Bn, HJ Rkt, SP.....	(5.52)	(2,508)	(680)	(1,200)	(4,388)	(3)
Hq & Hq Btry.....	(2.58)	(1,254)	(330)	(1,200)	(2,784)	(1)
2 FA Mal Btry, SP (ea).....	(1.47)	(627)	(175)	-----	(802)	(1)
MP Co.....	2.28	1,091	315	-----	1,406	0
Avn Bn.....	5.28	2,454	650	17,000	20,104	2
Hq & Hq Co.....	(1.41)	(615)	(180)	-----	(795)	(0)
Airmobile Co.....	(1.71)	(784)	(205)	(10,200)	(11,189)	(1)
AvnGS Co.....	(2.16)	(1,055)	(265)	(6,800)	(8,120)	(1)
Engr Bn.....	50.14	20,945	2,785	10,800	34,530	6
Hq & Hq Co.....	(10.65)	(3,195)	(520)	(10,800)	(14,515)	(1)
4 Engr Co (ea).....	(4.70)	(2,401)	(385)	-----	(2,786)	(1)
Brg Co.....	(20.69)	(8,146)	(725)	-----	(8,871)	(1)
Sig Bn.....	13.57	6,616	1,740	2,400	10,756	3
Hq & Hq Co.....	(1.38)	(674)	(165)	(2,400)	(3,239)	(0)
Comd Op Co.....	(3.99)	(2,006)	(505)	-----	(2,511)	(1)
Fwd Comm Co.....	(4.32)	(2,006)	(575)	-----	(2,581)	(1)
Sig Spt Co.....	(3.88)	(1,930)	(495)	-----	(2,425)	(1)
Spt Comd.....	53.64	25,090	4,945	81,200	111,235	18
Hq & Hq Co & Band.....	(1.07)	(524)	(140)	-----	(664)	(1)
Admin Co.....	(1.35)	(676)	(175)	-----	(851)	(2)
Med Bn.....	(8.67)	(4,028)	(1,160)	-----	(5,188)	(8)
Hq & Spt Co.....	(3.15)	(1,535)	(410)	-----	(1,945)	(2)
3 Med Co (ea).....	(1.84)	(831)	(250)	-----	(1,081)	(2)
Sup & Trans Bn.....	(13.60)	(7,689)	(1,270)	(75,200)	(84,159)	(2)
Hq & Hq Co.....	(.98)	(436)	(130)	-----	(566)	(2)
Sup & Svc Co.....	(1.70)	(1,317)	(190)	(18,000)	(19,507)	(0)
Trans MT Co.....	(10.92)	(5,936)	(950)	(57,200)	(64,086)	(0)

See footnotes at end of table.

Unit	Fuel to move 1 km (gal)	Fuel capacity (gal)				
		Vehicle tanks gas/diesel	Gas cans	Bulk fuel	Total Fuel capacity	Organic kitchens
Maint Bn.....	(28.95)	(12,173)	(2,200)	(6,000)	(20,373)	(5)
Hq & Maint Spt Co.....	(9.43)	(3,931)	(625)	(1,200)	(5,756)	(1)
3 Fwd Spt Co (ea).....	(5.21)	(2,067)	(410)	(1,200)	(3,677)	(1)
Acft Maint Co.....	(3.89)	(2,041)	(345)	(1,200)	(3,586)	(1)
Total Div.....	491.11	201,764	25,870	195,800	423,434	100

¹ Data contained in this table are recommended for *planning purposes only*. It does not include fuel consumption of technical vehicular mounted equipment, nor that of bulldozers, scoop type loaders or forklift trucks which normally do not move on their own power in long marches.

² When div is not on the march 4000 gal of fuel are required for administrative vehicles, kitchens, and gasoline powered equipment. Daily gasoline consumption per kitchen is 15 gal (div total 1500 gal).

³ For cross-country battle conditions, fuel is multiplied by 2.5. (The 10% handling factor need not be applied when this factor is used.)

⁴ Gasoline reserve in vehicles has been computed as two 5-gal cans per truck, except for $\frac{1}{4}$ T trucks which carry one 5-gal can each, and wreckers (2½ ton and 5 ton) which carry four 5-gal cans each.

⁵ Division diesel fuel consumption per kilometer is 108.06 gal. The following ratio of fuel bulk carriers will apply:

Infantry Bn—all gasoline

Tank Bn—3 diesel to 1 gasoline

Sup & Trans Bn—4 gasoline to 1 diesel

⁶ "Bulk Fuel" column represents carrying capacity of all bulk metal tankers, collapsible containers and fuel dispensing vehicles organic to Division.

⁷ Table does not include consumption data for Army aircraft.

⁸ To obtain lubricating oil requirements in gallons multiply gross vehicular fuel requirements by a factor of .02.

b. Mechanized Division (TOE 37E)^{1,2,3,4,5,6,7,8}

Unit	Fuel to move 1 km (gal)	Fuel capacity (gal)				
		Vehicle tanks gas/diesel	Gas cans	Bulk fuel	Total fuel capacity	Organic kitchens
Hq & Hq Co, Mech Div.....	3.83	1,686	245	-----	1,931	2
3 Hq & Hq Co, Mech Bde (ea).....	4.87	1,927	260	1,700	3,887	1
7 Mech Inf Bn (ea).....	30.81	11,832	450	7,200	19,482	4
Hq & Hq Co.....	(13.53)	(5,580)	(330)	(7,200)	(13,110)	(4)
3 Rifle Co (ea).....	(5.76)	(2,084)	(40)	-----	(2,124)	(0)
3 Tank Bn (ea).....	75.94	29,491	665	10,200	40,356	4
Hq & Hq Co.....	(25.24)	(8,716)	(560)	(10,200)	(19,476)	(4)
3 Tank Co (ea).....	(16.90)	(6,925)	(35)	-----	(6,960)	(0)
Cav Sqdn.....	50.95	14,836	865	12,800	28,501	5
Hq & Hq Trp.....	(10.49)	(4,813)	(545)	(6,000)	(11,358)	(5)
3 Armd Cav Trp (ea).....	(13.02)	(3,070)	(45)	-----	(3,115)	(0)
Air Cav Trp.....	(1.40)	(813)	(185)	(6,800)	(7,798)	(0)
Div Arty.....	89.98	36,898	4,565	14,900	56,363	21
Hq & Hq Btry.....	(4.21)	(1,931)	(555)	(2,900)	(5,386)	(1)
3 FA How Bn, 105-mm, SP (ea).....	(19.03)	(7,579)	(800)	(2,400)	(10,779)	(4)
Hq & Hq Btry.....	(7.54)	(3,517)	(470)	(2,400)	(6,387)	(1)
3 FA How Btry, 105-mm, SP (ea).....	(3.83)	(1,354)	(110)	-----	(1,464)	(1)
FA How Bn, 155-mm/8 in. SP.....	(23.02)	(9,722)	(930)	(3,600)	(14,252)	(5)
Hq & Hq Btry.....	(7.70)	(3,136)	(500)	(3,600)	(7,236)	(1)
3 FA How Btry, 155-mm, SP (ea).....	(3.72)	(1,301)	(95)	-----	(1,396)	(1)
FA How Btry, 8-in. SP.....	(4.30)	(2,683)	(145)	-----	(2,828)	(1)
FA Msl Bn, HJ Rkt, SP.....	(5.52)	(2,508)	(680)	(1,200)	(4,388)	(3)
Hq & Hq Btry.....	(2.58)	(1,254)	(330)	(1,200)	(2,784)	(1)
2 FA Msl Btry, HJ, SP (ea).....	(1.47)	(627)	(175)	-----	(802)	(1)

See footnotes at end of table.

Unit	Fuel to move 1 km (gal)	Fuel capacity (gal)				
		Vehicle tanks gas/diesel	Gas cans	Bulk fuel	Total fuel capacity	Organic kitchens
MP Co.....	2.28	1,091	315	-----	1,406	0
Avn Bn.....	5.28	2,545	650	17,000	20,104	2
Hq & Hq Co.....	(1.41)	(615)	(180)	-----	(795)	(0)
Airmobile Co.....	(1.71)	(784)	(205)	(10,200)	(11,189)	(1)
Avn GS Co.....	(2.16)	(1,055)	(265)	(6,800)	(8,120)	(1)
Engr Bn.....	56.09	21,352	1,700	10,800	33,852	6
Hq & Hq Co.....	(11.00)	(3,314)	(515)	(10,800)	(14,629)	(1)
4 Engr Co (ea).....	(6.10)	(2,473)	(115)	-----	(2,588)	(1)
Brg Co.....	(20.69)	(8,146)	(725)	-----	(8,871)	(1)
Sig Bn.....	13.57	6,616	1,740	2,400	10,756	4
Hq & Hq Co.....	(1.38)	(674)	(165)	(2,400)	(3,239)	(1)
Comd Op Co.....	(3.99)	(2,006)	(505)	-----	(2,511)	(1)
Fwd Comm Co.....	(4.32)	(2,006)	(575)	-----	(2,581)	(1)
Sig Spt Co.....	(3.88)	(1,930)	(495)	-----	(2,425)	(1)
Spt Comd.....	56.69	27,835	5,400	131,200	164,435	18
Hq & Hq Co & Band.....	(1.07)	(524)	(140)	-----	(664)	(1)
Admin Co.....	(1.35)	(676)	(175)	-----	(851)	(2)
Med Bn.....	(8.67)	(4,028)	(1,160)	-----	(5,188)	(8)
Hq & Spt Co.....	(3.15)	(1,535)	(410)	-----	(1,945)	(2)
3 Med Co.....	(1.84)	(831)	(250)	-----	(1,081)	(2)
Sup & Trans Bn.....	(15.59)	(8,789)	(1,390)	(125,200)	(135,379)	(2)
Hq & Hq Co.....	(.98)	(436)	(130)	-----	(566)	(2)
Sup & Svc Co.....	(1.70)	(1,317)	(190)	(18,000)	(19,507)	(0)
Trans MT Co.....	(12.91)	(7,036)	(1,070)	(107,200)	(115,306)	(0)
Maint Bn.....	33.01	13,818	2,535	6,000	22,353	5
Hq & Maint Spt Co.....	(11.57)	(4,742)	(780)	(1,200)	(6,722)	(1)
3 Fwd Maint Co.....	(5.89)	(2,345)	(470)	(1,200)	(4,015)	(1)
Acft Maint Co.....	(3.77)	(2,041)	(345)	(1,200)	(3,586)	(1)
Total Div.....	739.77	289,846	21,405	275,200	586,451	101

¹ Data contained in this table are recommended for planning purposes only. It does not include fuel consumption of technical vehicular mounted equipment nor that of bulldozers, scoop type loaders or forklift trucks which normally do not move on their own power in long marches.

² When div is not on the march 4000 gal of fuel are required for administrative vehicles, kitchens, and gasoline powered equipment. Daily gasoline consumption per kitchen is 15 gal (div total 1515 gal).

³ For cross-country battle conditions, fuel is multiplied by 2.5. (The 10% handling factor need not be applied when this factor is used.)

⁴ Gasoline reserve in vehicles has been computed as two 5-gal cans per truck, except for ¼T trucks which carry one 5-gal can each, and wreckers (2½ ton and 5 ton) which carry four 5-gal cans each.

⁵ Division diesel fuel consumption per kilometer is 212.26 gal. The following ratio of fuel hulk carriers will apply:

Tank Bn—3 diesel to 1 gasoline

Bech Inf Bn—all gasoline

Sup & Trans Bn—gasoline to 1 diesel

Div Arty—3 gasoline to 1 diesel

⁶ "Bulk Fuel" column represents carrying capacity of all bulk metal tankers, collapsible containers and fuel dispensing vehicles organic to Division.

⁷ Table does not include consumption data for Army aircraft.

⁸ To obtain lubricating oil requirements in gallons multiply gross vehicular fuel requirements by a factor of .02.

5-20. Gasoline and Oil Data—Armor Units (Nondivisional)

	1	2	3	4	5	6	7	8	9	10	11
	Unit	Fuel and lubricant requirements—motor vehicles Consumption in moving veh 160 km (100 miles)					Fuel capacity (gal) gas/diesel				Organic kitchens
1		Vehicle fuel (gal) Diesel	Vehicle fuel (gal) gasoline	Engine oil (gal)	Lubricant (lb)	Misc grease (lb)	Veh tanks	Veh Cans	Bulk tankers	Total veh tanks	
2	Hq & Hq Co, Sep Armd Bde.....	53.2	792.2	4.4	6.9	4.5	2,534	380	1,200	4,114	1
3	Tank Bn, Sep Armd Bde.....	Same as Tk Bn, Armd Div.									
4	Armd Cav Trp, Sep Armd Bde.....	Same as Armd Cav Troop, Armd Cav Sqdn, Armd Div.									

5-21. Gasoline, Diesel, and Oil Supply Data—Artillery Units (Nondivisional)

a. Air Defense Artillery.^{1 2}

1	2	3	4	5	6	7	8	9	10	11	12
Unit	Fuel and lubricant requirement—motor vehicle consumption in moving 100 miles/160 km				Gasoline, diesel cap (gal)						Remarks
	Vehicle fuel gas/diesel	Eng oil (gal)	Gear lub (lbs)	Grease Misc. (lbs)	Vehicle tanks	Organic tanks	Vehicle 5 gal cans (gas)	Kitchen misc (gas)	Generator tanks	Total	
Hq & Hq Btry ADA Bde	346	8.2	13.8	8.5	996	600	125	50	18	1,789	No diesel required.
Hq & Hq Btry ADA Group	276	7.1	11.5	7.5	828	600	110	50	9	1,597	No diesel required.
ADA AW Bn SP	9,044	293.3	153.1	165.1	13,037	13,800	570	250	182	27,839	No diesel required.
ADA Msl Bn HAWK	3,484				8,077	18,000			1,684	29,036	
	G 3,404	80.2	141.8	81.1	G 7,653	G 6,000	1,025	250	G 377	G 15,305	
	D 80				D 424	D 12,000			D 1,307	D 13,731	
ADA Msl Bn Nike-Hercules	12,480				8,926	19,200			2,125	30,501	
	G 12,400	211.6	300.7	334.9	G 8,706	G 9,600	720	250	G 302	G 19,578	Bn has organic veh to move one firing btry.
	D 80				D 220	D 9,600			D 1,823	D 11,643	Bn trans sect will travel 1,127 km to move bn 160 km.

¹ Average daily gasoline consumption is 15 gal per kitchen.

² Fuel for operation of generators etc., must be computed separately.

G = Gasoline

D = Diesel

b. Field Artillery.

1	2	3	4	5	6	7	8	9	10	11	12
Unit	Fuel and lubricant requirements—motor vehicle consumption in moving unit. 160 kilometers				Gasoline, diesel capacity (gal)			Other fuel requirements			Remarks
	Vehicle Fuel Gas/Diesel	Eng oil (Gal)	Gear Lubricant (lb)	Grease Misc (lb)	Vehicle Tanks	Vehicle Cans & Bulk Tanks	Total Vehicle & Bulk Capacity	Kitchens (Gals)	Generators (Gals)	Total Fuel (Columns 9 & 10)	
1 HQ & HQ BTRY CORPS ARTY (AIRBORNE ARTY)	689.0 G 689.0 D -----	13.8	22.5	16.9	1,639.0 G 1,639.0 D -----	*1,600 G 1,600 D -----	*3,239.0 G 3,239.0 D -----	15.0 G 15.0 D -----	181.8 G 181.8 D -----	196.8 G 196.8 D -----	*Includes 500 gals Avn Gas 1-Kitchen TOE 6-501E
2 HQ & HQ BTRY FA GRP	398.1 G 398.1 D -----	8.0	11.7	10.1	898.7 G 898.7 D -----	305.0 G 305.0 D -----	1,203.7 G 1,203.7 D -----	15.0 G 15.0 D -----	113.0 G 113.0 D -----	128.0 G 128.0 D -----	1-Kitchen TOE 6-401E
3 FA BN 105-MM TOWED	1,842.1 G 1,842.1 D -----	40.0	50.9	37.9	4,423.7 G 4,423.7 D -----	*3,885.0 G 3,885.0 D -----	*8,308.7 G 8,308.7 D -----	60.0 G 60.0 D -----	321.4 G 321.4 D -----	381.4 G 381.4 D -----	*Includes 500 gals Avn Gas 4-Kitchens TOE 6-405E
4 FA BN 105-MM, SP	2,773.8 G 1,459.8 D 1,314.0	67.8	63.0	40.8	6,582.6 G 3,342.6 D 3,240.0	*3,895.0 G 1,955.0 D 1,440.0	*10,477.6 G 5,297.6 D 4,680.0	60.0 G 60.0 D -----	296.6 G 296.6 D -----	356.6 G 356.6 D -----	*Includes 500 gals Avn Gas 4-Kitchens TOE 6-465E
5 FA BN 155-MM, TOWED	2,195.0 G 2,195.0 D -----	47.0	43.5	39.5	4,905.0 G 4,905.0 D -----	3,380.0 G 3,380.0 D -----	8,285.0 G 8,285.0 D -----	60.0 G 60.0 D -----	359.2 G 359.2 D -----	419.2 G 419.2 D -----	4-Kitchens TOE 6-425E
6 FA BN 155-MM, SP	3,187.8 G 1,513.8 D 1,674.0	72.6	62.6	48.0	7,790.6 G 3,470.6 D 4,320.0	*5,300.0 G 2,570.0 D 2,130.0	*13,090.6 G 6,040.6 D 6,450.0	60.0 G 60.0 D -----	345.6 G 345.6 D -----	405.6 G 405.6 D -----	*Includes 600 gals Avn Gas 4-Kitchens TOE 6-445E
7 FA BN 8-IN, TOWED	2,405.6 G 2,375.6 D 30.0	30.0	51.4	58.5	5,936.7 G 5,892.2 D 44.5	*4,180.0 G 3,570.0 D 10.0	*10,116.7 G 9,472.2 D 54.5	75.0 G 75.0 D -----	479.4 G 479.4 D -----	554.0 G 554.0 D -----	*Includes 600 gals Avn Gas 5-Kitchens TOE 6-415E
8 FA BN 8-IN, SP	3,471.6 G 1,931.6 D 1,540.0	65.2	63.6	46.4	10,245.7 G 4,501.2 D 5,744.5	*4,310.0 G 2,220.0 D 1,490.0	*14,555.7 G 6,721.2 D 7,234.5	75.0 G 75.0 D -----	464.4 G 464.4 D -----	539.4 G 539.4 D -----	*Includes 600 gals Avn Gas 5-Kitchens TOE 6-445E
9 FA BN 175-MM, SP	3,288.6 G 1,868.6 D 1,420.0	68.2	58.5	49.0	9,662.7 G 4,278.2 D 5,384.5	*4,200.0 G 2,140.0 D 1,460.0	*13,862.7 G 6,418.2 D 6,844.5	75.0 G 75.0 D -----	413.2 G 413.2 D -----	488.2 G 488.2 D -----	*Includes 600 gals Avn Gas 5-Kitchens TOE 6-435D

10	FA BN 280-MM, TOWED	G 3,469.4 D 3,189.4 D 280.0	50.8	50.8	41.0	G 6,837.8 D 6,417.8 D 420.0	G 4,780.0 D 3,540.0 D 1,240.0	G 11,617.8 D 9,957.8 D 1,660.0	60.0 60.0 D -----	G 867.0 D 327.0 D 540.0	G 927.0 D 387.0 D 540.0	4-Kitchens TOE 6-535D
11	FA TAB	G 2,826.8 D 2,826.8 D -----	60.0	95.8	69.1	G 7,007.6 D 7,007.6 D -----	*10,360.0 G 10,360.0 D -----	*17,367.6 G 17,367.6 D -----	60.0 60.0 D -----	G 830.0 D 830.0 D -----	G 890.0 D 890.0 D -----	*Includes 1,200 gals Avn Gas 4-Kitchens TOE 6-575E
12	FA SLT BTRY	G 567.3 D 567.3 D -----	11.8	16.2	14.6	G 1,279.1 D 1,279.1 D -----	G 435.0 D 435.0 D -----	G 1,714.1 D 1,714.1 D -----	15.0 15.0 D -----	G 60.0 D 60.0 D -----	G 75.0 D 75.0 D -----	1-Kitchen TOE 6-558E
13	FA BN LITTLE JOHN	G 1,382.2 D 1,382.2 D -----	29.0	43.7	34.9	G 3,259.4 D 3,259.4 D -----	G 2,220.0 D 2,220.0 D -----	G 5,479.4 D 5,479.4 D -----	15.0 15.0 D -----	G 461.2 D 461.2 D -----	G 476.2 D 476.2 D -----	1-Kitchen TOE 6-565D
14	FA BN HONEST JOHN	G 1,599.4 D 1,599.4 D -----	34.4	49.2	36.7	G 3,883.8 D 3,883.8 D -----	G 4,610.0 D 4,610.0 D -----	G 8,493.8 D 8,493.8 D -----	60.0 60.0 D -----	G 532.4 D 532.4 D -----	G 592.4 D 592.4 D -----	4-Kitchens TOE 6-525E
15	FA BN LACROSSE	G 1,236.0 D 1,236.0 D -----	26.6	32.4	26.3	G 2,885.1 D 2,885.1 D -----	G 705.0 D 705.0 D -----	G 3,590.1 D 3,590.1 D -----	15.0 15.0 D -----	G 230.0 D 50.0 D 180.0	G 245.0 D 65.0 D 180.0	1-Kitchen TOE 6-585T
16	FA BN CORPORAL	G 1,300.6 D 1,276.6 D 24.0	30.2	36.3	27.1	G 3,507.2 D 3,507.2 D -----	G 1,870.0 D 1,870.0 D -----	G 5,377.2 D 5,377.2 D -----	15.0 15.0 D -----	G 772.8 D 292.8 D 480.0	G 787.8 D 307.8 D 480.0	1-Kitchen TOE 6-545E
17	FA BN REDSTONE	G 3,801.1 D 3,753.1 D 48.0	107.4	125.4	91.9	G 11,616.9 D 11,616.9 D -----	G 23,255.0 D 18,255.0 D 5,000.0	G 34,871.9 D 29,871.9 D 5,000.0	45.0 45.0 D -----	G 2,321.6 D 1,001.6 D 1,320.0	G 2,366.6 D 1,046.6 D 1,320.0	3-Kitchens TOE 6-635E
18	FA BN SERGEANT	G 1,953.6 D 1,953.6 D -----	46.2	58.9	44.5	G 5,120.0 D 5,120.0 D -----	G 1,170.0 D 1,170.0 D -----	G 6,290.0 D 6,290.0 D -----	45.0 45.0 D -----	G 711.4 D 711.4 D -----	G 756.4 D 756.4 D -----	3-Kitchens TOE 6-555T
19	FA BN PERSHING	G 5,359.3 D 5,289.3 D 70.0	96.6	94.4	81.1	G 12,165.0 D 11,865.0 D 300.0	*10,595.0 G 8,195.0 D 1,200.0	*20,060.0 G 1,500.0 D 1,200.0	90.0 90.0 D -----	G 1,800.2 D 840.2 D 960.0	G 1,890.2 D 930.2 D 960.0	*Includes 1,200 gals Avn Gas 6-Kitchens TOE 6-615T

G = Gasoline.
D = Diesel.

5-22. Gasoline and Oil Supply Data—Chemical Units¹

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit	Fuel and lubricant requirements—motor vehicle Consumption in moving unit 100 miles/160 km				Gasoline capacity (gal)			Fuel can data, number of cans 5-gal gasoline			Organic kitchens ²
		Vehicle fuel (gal)	Engine oil (gal)	Gear lubrication (lb)	Grease miscellaneous (lb)	Vehicle tanks	Vehicle cans 5-gal	Total vehicle tanks; vehicle cans 5-gal	Resupply kitchens, and miscellaneous	Motor vehicles	Total miscellaneous and motor vehicles	
2	Hq & Hq det, cml gp.....	96.8	2.4	3.2	2.4	236	100	336	6	14	20	-----
3	Hq & Hq det, cml smoke genr bn.....	65.3	1.4	2.0	1.6	149	65	214	4	9	13	-----
4	Cml Smoke genr co ³	541.9	12.4	18.7	12.7	1,315	920	⁴ 4,625	⁵ 119	65	184	1
5	Hq & Hq det, cml bn, svc.....	68.4	1.6	2.4	1.6	168	75	243	7	8	15	-----
6	Cml maint co.....	255.1	5.0	9.4	5.4	613	250	863	21	29	50	1
7	Cml depot co.....	228.4	4.8	8.8	4.8	568	265	833	25	28	53	1
8	Cml decon co.....	476.4	9.4	17.1	10.3	990	310	1,300	18	44	62	1
9	Cml direct spt co.....	1,198.2	25.2	39.0	28.2	2,784	1,170	3,954	78	156	234	1
10	Cml gen spt co.....	493.4	9.4	21.3	9.9	1,290	530	1,820	62	44	106	1

¹ Computation must be made separately for daily requirements of class III supplies for operation of electric generators, heaters, pumps, etc.

² Average daily consumption of gasoline is 15 gallons per kitchen.

³ Chemical smoke generator company has a basic load of 144 drums (55 gal) of fog

oil (class III supply) as fuel for smoke generator operations.

⁴ Includes 2400 gallons of gasoline in four 600-gallon truck-mounted tanks.

⁵ Includes basic load of 96 5-gallon cans of gasoline (2 cans per smoke generator) for smoke generator operations.

5-23. Gasoline and Oil Supply Data—Army Security Agency Units

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Unit	Fuel and Lubricant Requirements motor vehicle consumption in moving unit 100 miles/160.9 km				Gasoline Capacity (gal)			Fuel can data, number of organic fuel cans			Number of generators					Organic kitchens
	Vehicle fuel (gal)	Engine oil (gal)	Gear lubrication (lb)	Grease miscellaneous (lb)	Vehicle tanks	Vehicle cans 5-gal	Total vehicle tanks vehicle cans 5-gal	Resupply kitchens, and miscellaneous	Motor vehicles (1 can per vehicle)	Total miscellaneous and motor vehicles	Gas (KW)				Diesel (KW)	
											1.50	3.00	5.00	10.00	15.00	
HQ & HQ co, ASA gp...	619.5	13.2	21.9	13.2	1,505	1,370	2,875	257	41	298	3	1	7	3	6	1
HQ & HQ co, ASA bn...	576.9	11.8	19.8	12.3	1,373	1,255	2,628	214	37	251	9	1	9	2	3	1
ASA op co (A).....	1,055.0	21.6	41.0	21.8	2,618	2,575	5,193	455	60	515	1		15	3	12	1
ASA co (scty).....	410.1	10.4	17.5	11.5	1,201	1,320	2,521	227	37	264	17		13	3		1
ASA co (proc).....	620.4	12.6	24.3	12.7	1,542	1,745	3,287	315	34	349	1		5	2	11	1
ASA div spt co (inf or abn).....	905.5	18.2	28.0	21.6	2,041	1,190	3,231	163	75	238	50	10	7	3		1
ASA div spt co (armd or mech).....	1,233.5	15.0	23.2	16.8	2,697	1,410	4,107	210	72	282	26	15	5	3		1

5-24. Gasoline and Oil Supply Data—Selected Service Units ^{1 2}

[Located in back of manual]

Section V. CLASS V SUPPLY

5-25. Ammunition Service

a. Traditionally, ammunition has been considered as just class V. Ammunition must now be recognized as a service, encompassing both the supply and maintenance of conventional and special ammunition and the class II and IV items peculiar to ammunition. It also includes the specialized services closely associated with ammunition; e.g., escort, calibration, and disposal. The scope of ammunition service will vary widely in accordance with the manner of conflict in which US forces will be employed and the operational environment within which these forces will fight.

b. The following paragraphs include a coverage of the interrelationships of ammunition and tactics, the factors which govern the establishment and adjustment of ammunition supply levels, and basic information on ammunition supply and maintenance procedures. It is intended to provide an insight into ammunition service and to promote understanding among tactical and ammunition service commanders.

c. The tables in this section contain logistical planning data for conventional ammunition. These tables are as follows:

- (1) Combat vehicle ammunition data.
- (2) Estimated expenditures of ammunition.
 - (a) Ammunition per weapon per day, expressed in rounds.
 - (b) Ammunition per type unit per day, expressed in tons.
- (3) Field artillery ammunition expenditures.
 - (a) Expressed in rounds per weapon per hour.
 - (b) Expressed in tons per battalion per hour.
- (4) Airborne division basic load.
- (5) Armored division basic load.
- (6) Infantry division basic load.
- (7) Mechanized division basic load.
- (8) Artillery unit basic load (nondivisional, divisional, and resupply capacity of organic ammunition vehicles).

- (9) Armored division basic load (nondivisional).
- (10) Chemical unit basic load.
- (11) Engineer unit basic load (nondivisional).
- (12) Signal unit basic load (nondivisional).
- (13) Army security unit basic load.
- (14) Military Police unit basic load (nondivisional).
- (15) Service unit basic load.

d. Logistical data on special ammunition is contained in FM 101-10-3. Details on supply, maintenance, and other aspects of ammunition services are contained in FM 9-6.

e. Detailed information regarding estimated average quantity of ammunition required per day to sustain operations in an active combat theater is contained in SB 38-26. Days of supply authorized oversea commands is contained in AR 11-12.

5-26. Interrelationships of Tactics and Ammunition Service

Ammunition directly influences tactical operations. For this reason, tactical commanders must plan their operations and commit their forces with full awareness of the support capabilities of the ammunition service support structure. Equally so, logistical commanders must establish, stock, and employ ammunition service units with full awareness of the operational plans of the tactical commanders. An imbalance of either tactics or ammunition service may decisively influence operations. Therefore, they must not be considered as individual entities, but as an inseparable unity—requiring maximum attention, cooperation, and coordination.

5-27. Ammunition Supply Levels

Levels of ammunition supply are normally expressed in terms of days of supply for each theater of operations and for major commands within each theater. These supply levels will be established initially in accordance with available experience on the amount of ammunition consumed per average day. Available ammunition assets will then be announced, expressed in terms of these average days. A day of supply

will be recomputed as additional consumption experience is gained. The logistical system will attempt to match the receipt of ammunition to the consumption or planned consumption so that the desired balance of reserves on hand can be maintained. Therefore above average consumption by one part of the force tends to be balanced by limiting the consumption of another part of the force. Major commanders will desire to maintain a planned level of supply as being the minimum acceptable level of reserves. To change this level of supply by increasing the level of receipts requires a planning leadtime which is in excess of tactical and operational planning leadtime. Factors which cause this long leadtime are procurement and production, order and ship time, type and quantity of transportation available, amount of storage space in a theater, physical security forces available to protect shipments and storage areas, and the degree of control over the tactical situation.

5-28. Conventional Supply System

Conventional ammunition service in the field army is generally based on a continuous refill system. Tactical units are responsible for maintaining, at all times, a basic load of ammunition. Replenishment of ammunition expended by units is either concurrent with or in anticipation of an immediate requirement. Withdrawals from ammunition supply points (ASP's) are replenished by shipments from the COMMZ or combat zone depots. Stock levels to be maintained in ammunition installations of the armies and in advanced depots of the COMMZ are prescribed, and ammunition is moved forward to maintain these levels. Ammunition is controlled by a system of credits to army and by a system of rationing and restrictions (stated as available supply rate) on firing within the Army. Below the army level, the credit system is not used. The allocation of credits to armies in COMMZ depots, the an-

nouncement of available supply rates, the continuous refill system whereby units maintain their basic loads at prescribed levels, and a system of ammunition reports provide the degree of control required by the situation.

5-29. Conventional Ammunition Control Procedures

The procedures for supply and stock control of conventional ammunition involve the basic load, the required supply rate, the available supply rate, and the functions of major command ammunition officers as well as staff responsibilities of the G3 (S3) and G4 (S4). (See FM 9-6 and AR 320-5 for definitions and details.)

5-30. Special Ammunition Supply System

The basic load and automatic resupply system which applies to conventional ammunition does not apply to special ammunition. Special ammunition service in the field is based on special ammunition stockages, special ammunition loads, and an allocation system. (See AR 320-5 for definitions of these terms.) Allocations of special ammunition are made to commanders by specific item for a specific length of time or action. Commanders prescribe the distribution of available weapons to include designation of ownership, storage units, location, type weapons, yields, and total numbers. Special ammunition will be provided to special forces on an as-required basis and will be considered as expended once issued. (See FM 31-21 and FM 31-21A.) Stockage of class II and IV items peculiar to special ammunition are governed by the principles of the Army Field Stock Control System (AR 711-16). (Details on special ammunition supply and control are contained in FM 9-6.)

5-31. Combat Vehicle Ammunition Data

[Located in back of manual]

5-32. Estimated Expenditures of Ammunition¹a. Ammunition Per Weapon Per Day, Expressed in Rounds.²

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Weapon	Type of combat													
		Attack of position					Covering and security force action	Defense of position		Inactive situation	Meeting engagement	Pursuit	Retirement or delaying action	Assault of hostile shore	Protracted period
		Permanent fortifications		Deliberately organized		Hastily organized									
		First day	Succeeding days	First day	Succeeding days										
2	Carbine, cal .30.....	6	3	6	3	5	4	8	6	1.0	4	1.0	3.0	5	2.0
3	Gun, mach, cal .30, Bng.....	170	100	160	90	120	100	200	120	40.0	100	20.0	70.0	120	50.0
4	Gun, submach, cal .45.....	35	20	35	20	25	20	40	25	8.0	20	4.0	15.0	25	10.0
5	Gun, mach, cal .50, Bng, hv bbl ³	50	30	50	30	35	30	60	35	15.0	30	5.0	20.0	35	20.0
6	Howitzer, 105-mm, towed or SP.....	150	90	145	80	110	90	180	110	35.0	90	18.0	65.0	110	45.0
7	Howitzer, 155-mm, towed or SP.....	120	70	110	65	85	0	140	85	30.0	70	15.0	50.0	85	35.0
8	Howitzer, 8-in, towed or SP.....	85	50	80	45	60	0	100	60	20.0	50	0.0	0.0	60	25.0
9	Launcher, rkt, 3.5-in.....	5	3	5	3	3	2	6	4	1.0	2	1.0	2.0	4	1.5
10	Mortar, 81-mm.....	70	40	64	35	50	40	80	50	16.0	40	8.0	30.0	50	20.0
11	Mortar, 107-mm.....	70	40	64	35	50	40	80	50	16.0	40	8.0	30.0	50	20.0
12	Pistol, auto, cal .45.....	2	1	2	1	1	1	2	1	0.2	1	0.2	0.3	2	0.3
13	Rifle, U. S., cal .30.....	20	15	30	15	15	15	25	15	5.0	15	3.0	10.0	15	6.0
14	Rifle, auto, cal .30, Bng.....	70	40	65	35	50	40	80	50	15.0	40	8.0	30.0	50	20.0
15	Tk, cmbt, full-tracked, 76-mm gun.....	15	8	13	7	10	8	16	10	3.0	8	2.0	5.0	10	4.0
16	Tk, cmbt, full-tracked, 90-mm or 105-mm gun.....	22	12	20	11	15	12	25	15	5.0	12	3.0	8.0	15	6.0
17	M72, light antitank weapon 66-mm.....	5	3	5	3	3	2	6	4	1.0	2	1.0	2.0	4	2.0
18	90-mm rifle M67.....	4	3	4	3	3	2	5	3	1.0	2	1.0	2.0	4	2.0
19	40-mm grenade lchr M67.....	16	10	16	10	10	8	18	12	3.0	6	3.0	6.0	12	6.0
20	40-mm grenade lchr M75 (helicopter) (M5).....	500	300	500	300	300	200	600	400	100.0	200	100.0	200.0	400	200.0

¹ For ammunition data pertaining to air defense artillery, see FM 101-10-3, chapter 5, section II.

² Figures were derived from a study of World War II experience plus consideration

of postwar development of materiel and reorganization of units. The quantities are representative of actual requirements when applicable to units of brigade size or larger.

³ Multiple mounts will require specified quantities for each barrel.

b. Ammunition Per Type Unit Per Day, Expressed in Tons.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Unit	Type of combat													
		Attack of position					Covering and security force action	Defense of position		Inactive situation	Meeting engage- ment	Pursuit	Retire- ment or delaying action	Assault of hostile shore	Protracted period
		Permanent fortifications		Deliberately organized		Hastily organ- ized		First day	Succeed- ing days						
		First day	Succeed- ing days	First day	Succeed- ing days										
2	Airborne Division	474	282	452	254	340	271	564	340	109	271	64	201	350	147
3	Armored Division	832	482	778	436	590	383	969	596	192	476	107	321	598	247
4	Infantry Division	658	385	612	353	464	285	768	472	154	378	83	256	423	194
5	Mechanized Division	714	417	670	378	509	317	835	516	167	411	91	278	516	214
6	Corps Arty 155-mm Howitzer (per bn)	121	71	111	66	86	80	142	86	30	71	15	51	86	35
7	Corps Arty 8-inch Howitzer (per bn)	116	68	110	62	82	0	137	82	27	68	0	0	82	34

NOTES

¹ Tonnages based on ROAD weapon density.² Consumption rates based on WWII and Korea experience.³ Computations include equivalent substitution of 7.62-mm weapons for cal .30 weapons.⁴ Ammunition for 40-mm grenade launcher; 90-mm, 106-mm, 120-mm rifles; and 2.75 rocket, are included in the tonnages. Weapon basic loads are used as a peak daily consumption.⁵ Weights are unpacked. Add 15 percent (approx) for packaged weight. Consult current supply manuals for actual packaged weight.

5-33. Field Artillery Ammunition Expenditures*a. Expressed in Rounds Per Weapon Per Hour.*

1	Kind of fire or phase of action	2	3	4	5	6	7
		Average rate per piece per hour					
		105	155	175	8-in.	LJ	HJ
2	Advance guard action, development, and deployment.....	25	12	8	8	.25	.125
3	Preparation.....	80	25	28	25	1	.75
4	Supporting fires during the attack (including counterbattery):						
	First 2 hours.....	50	25	28	25	.5	.5
5	After 2 hours.....	30	15	17	15	.25	.125
6	Exploitation, pursuit, delaying section, or delaying enemy development.....	25	12	16	12	1	.5
7	Counterpreparation.....	60	25	28	25	.125	.125
8	Defensive fires against infantry attack (including counterbattery)....	50	25	28	25	1	.5
9	Fortified position.....	50	25	28	25	.125	.125

Notes. 1. Figures in Column 7 are in support of ground division and nondivision maneuver units.

2. Figures in Column 6 represent expenditures in support of Airborne or Air Assault Division Operations.

b. Expressed in Tons Per Battalion Per Hour.

1	Kind of fire or phase of action	2	3	4	5	6	7
		Average rate per piece per hour					
		105	155	175	8-in.	LJ	HJ
2	Advance guard action, development, and deployment.....	11.02	12.35	9.96	9.96	1.5	2.25
3	Preparation.....	35.28	25.87	35.37	33.78	6.0	13.50
	Supporting fires during the attack (including counterbattery):						
4	First 2 hours.....	22.05	25.87	35.37	33.78	3.0	9.00
5	After 2 hours.....	13.22	15.52	21.55	20.00	1.5	2.25
6	Exploitation, pursuit, delaying action, or delaying enemy development..	11.02	12.52	20.24	16.17	6.0	9.00
7	Counterpreparation.....	26.46	25.87	35.37	33.78	.75	2.25
8	Defensive fires against infantry attack (including counterbattery)....	22.05	25.87	35.37	33.78	6.0	9.00

The figures in Columns 2, 3 and 5 are derived from World War II experience; they will require modification to fit modern organizations and tactical concepts. Figures in Column 7 are used in support of ground divisional and nondivisional maneuver units; figures in Column 6 are crated weight and are used in support of Airborne and Air Assault Division Operations.

5-34. Ammunition Supply Data—Airborne Division Basic Load (TOE 57E)

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	Total round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
HQ & HQ CO, ABN DIV (TOE 57-4E)											
Grenade, hand, frag-----		1.0/2.1		100			100	231.00			231.00
Pistol, cal .45-----	21	.044/.057	27	567	21	25.00					25.00
Rifle, 7.62-mm, semiauto, lt bbl-----	100	0.055/.079	107	10,700	100	588.50					588.50
Gun, mach, cal .50, hv bbl-----	525	0.390/.411	2	1,050			315	231.00	210	172.62	418.32
											1,262.82 = 0.63 tons
HQ & HQ CO, ABN DIV BDE (TOE 57-42E)											
Flare, surface, trip, M49-----		1.500/3.18		32			16	50.90	16	50.90	100.18
Grenade, hand, frag-----		1.0/2.1		100			100	231.00			231.00
Pistol, cal .45-----	21	.044/.057	26	546	21	24.03					24.03
Rifle, 7.62-mm, semiauto, lt bbl-----	160	0.055/.079	88	14,080	100	484.00	60	417.12			901.12
Gun, mach, 7.62-mm (kit, MG dual, hel)-----	7,480	0.063/.089	6	44,880			3,740	1,413.72	3,740	1,997.16	3,410.88
Gun, mach, cal .50, Bng, hv bbl-----	630	0.390/.411	2	1,260			420	345.24	210	172.62	517.86
Launcher, grenade, 40-mm-----	24	0.500/.806	3	72	6	9.00	6	14.50	12	29.00	52.50
Launcher, rocket, 3.5-in-----	6	9/17.700	4	6	3	318.60			3	318.60	637.20
											5,974.77 = 2.99 tons
INF BN (TOE 7-35E)											
Demolition kit, blasting, elec-nonelec, w/explo-----		150.000/		3		450.00					450.00
Flare, surface, trip, M49-----		1.500/3.18		80			80	254.50			254.50
Grenade, hand, frag-----		1.0/2.1		1,600					1,600	3,696.00	3,696.00
Ignition cylinder, flamethrower-----		/0.375		36			36	13.50			13.50
Thickener, ined oil, 2-lb can-----		2/		36			36	72.00			72.00
Pistol, cal .45-----	31	.044/.057	269	8,339	21	248.55			10	153.33	401.88
Rifle, 7.62-mm, semiauto, lt bbl-----	340	0.055/.079	523	177,820	100	2,876.50	120	4,958.04	120	4,958.04	12,792.58
Rifle, 7.62-mm, modified-----	740	0.055/.079	54	39,960	160	475.20	200	853.20	380	1,620.00	2,948.40
Gun, mach, 7.62-mm, lt wp, GP-----	3,080	.063/.089	24	73,920	880	1,872.00	1,320	2,808.00	880	1,872.00	6,552.00

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	Total round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
Gun, mach, cal .50, Bng, hv bbl.....	630	0.390/.411	14	8,820	420	2,416.40			210	1,208.20	3,624.60
Rifle, spotting, cal .50 (recoilless rifle 106-mm).....	220	0.390/.411	2	440	110	88.00			110	113.03	201.03
*Rifle, 90-mm, on mount, M67.....	18	9.250/15.0	18	324	6	999.00			12	3,240.00	4,239.00
Rifle, 106-mm, on mount.....	40	44/60	2	80	6	714.00			34	4,046.00	4,760.00
Launcher, grenade, 40-mm.....	30	0.500/.806	83	2,490	18	747.00	6	249.00	6	249.00	1,245.00
*Launcher, rocket, 3.5-in.....	6	9/17.700	17	102	3	901.00			3	901.00	1,802.00
Mortar, 81-mm, on mount.....	120	13.250	9	1,080	80	9,540.00			40	4,770.00	14,310.00
Mortar, 4.2-in, on mount.....	160	26/41.0	4	640	12	1,960.80			148	24,183.20	26,144.00
Launcher, AT Msle, (ENTAC).....	25		12	300	4	1,800.00	8	7,872.0	13	12,792.00	22,464.00
Mine, apers, M16.....		/11.25		160			80	900.00	80	900.00	1,800.00
Mine, at, M21.....		/22.70		48					48	1,089.60	1,089.60
Weapon, apers, M18.....		5.516/		198			90	496.50	108	595.80	1,092.30
TANK BN, ABN DIV (TOE 17-15E)											109,952.39= 54.96 tons
DML equip set, explo, initiating nonelec, w/explo.....		/110.00		1			1	110.00			110.00
Grenade, hand, colored, smoke, M18.....		1.25/		128			128	160.00			160.00
Grenade, hand, frag.....		1.00/2.10		1,000			1,000	2,100.00			2,100.00
Grenade, hand, incd, AN-M14.....		2.00/		359			359	718.00			718.00
Grenade, hand, smoke, HC.....		1.50/		32			32	48.00			48.00
Gun mach, cal .50 brg hv barrel flex.....	500	.39/.411	20	10,000			300	2,340.00	200	1,640.00	3,980.00
Gun, mach, cal .50 (OEM carrier comd and rcn M114).....	1,400	.39/.411	5	7,000			1,000	1,950.00	400	2,055.00	4,055.00
Gun, mach, 7.62-mm lt wt GP.....	3,080	.063/.089	1	3,080			2,200	138.60	880	78.32	216.92
Gun, mach, 7.62-mm (OEM carrier comd and rcn M114).....	3,520	.063/.089	5	17,600			2,640	831.60	880	391.60	1,223.20
Gun, self propelled, ft, 90-mm AT.....	89	64.5/69.0	47	4,183			29	87,913.50	60	194,580.00	282,493.50
Gun, submachine, cal .45.....	180	.044/.057	94	16,920			180	744.48			744.48
Launcher, grenade, 40-mm.....	30	.500/.806	15	450	18	135.00	6	72.54	6	72.54	280.08
Mortar, 4.2-inch.....	160	26/41	4	640			50	5,200.00	110	11,440.00	16,640.00
Pistol automatic cal .45.....	21	.044/.057	279	5,859	21	257.80					257.80
Rifle 7.62-mm semiautomatic lt barrel.....	340	.055/.079	211	71,740	100	1,160.50	120	2,000.28	120	2,000.28	5,161.06

Rifle 7.62-mm semiautomatic lt barrel w/bipod	740	.055/.079	2	1,480	160	17.60	380	60.04	200	31.60	109.24
Flare, surface, trip, M49		1.5/3.18		60			60	90.00			90.00
Weapon, antipers, M18		3.2/6.8		50			50	340.00			340.00
Starter, fire, NP3		0.06/		26			26	1.56			1.56
											318,678.84 =
											159.34 tons
ARMD CAV SQDN, ABN DIV (TOE 17-75E)											
Armt subsystem, hel, 7.62-mm XM-2	6,500	.063/.089	9	58,500			1,300	737.10	5,200	4,165.20	4,902.30
Armt subsystem hel, 2.75-in. rkt XM3	192	18/27.2	4	768			48	3,456.00	144	15,667.20	19,123.20
Armt subsystem, hel, 7.62-mm, quad, M6	21,600	.063/.089	9	194,400			7,200	453.60	14,400	11,534.40	11,988.00
Armt subsystem, hel, SS-11, M-22	36	61/150	4	144			6	1,464.00	30	18,000.00	19,464.00
DML equip set, explo, initiating nonelec w/explosives		110/	6				6	660.00			660.00
Grenade, hand, colored, smoke, M18		1.25/		252			252	315.00			315.00
Grenade, hand, frag		1.00/.210		1,000			1,000	1,000.00			1,000.00
Grenade, hand, incd, AN-M14		2.00/		388			388	766.00			776.00
Grenade, hand & rifle, smoke, wp		1.70/		48			48	81.60			81.60
Grenade, hand, HC		1.50/		48			48	72.00			72.00
Gun, mach, 7.62-mm lt wt, gp	3,080	.063/.089	36	108,880			2,200	4,989.60	880	2,819.52	7,809.12
Gun, mach, cal .50 bng, Hv BBL flex	500	0.390/0.411	18	9,000			300	2,106.00	200	1,480.00	3,586.00
Gun, sub mach, cal .45	180	.044/.057	24	4,320			180	200.64			200.64
Launcher, grenade, 40-mm	30	.5/.806	59	1,770	18	531.00	6	177.00	6	285.32	993.32
Mortar, 81-mm	120	11.4/13.25	6	720			80	5,472.00	40	3,180.00	8,652.00
Pistol, auto, cal .45	31	.044/.057	200	6,200	21	184.80			10	114.00	298.80
Rifle 106-mm	40	44/60	12	480			16	8,448.00	24	17,280.00	25,728.00
Rifle, semiauto, 7.62-mm LB	340	.055/.079	359	122,060	100	1,974.50	120	2,369.40	120	3,403.32	7,747.22
Rifle, semiauto, 7.62-mm LB w/BIPOD	740	.055/.079	20	14,800	160	176.00	380	600.40	200	316.00	1,092.40
Mine, antipers, M16		/11.25		160			80	900.00	80	900.00	1,800.00
Mine, antitank, M21		/22.7		48					48	1,089.60	1,089.60
Wpn, antipers, M18		3.2/6.8		198			90	288.00	108	734.40	1,022.40
Starter, fire, NP3		0.06/		24			24	1.44			1.44
											118,403.04 =
											59.2 tons
AVN BN (TOE 1-55E)											
Grenade, hand, frag		1.0/2.1		150			150	345.00			345.00
Pistol, cal .45	21	.044/.056	79	1,659	21	72.99					72.99
Rifle, 7.62-mm, semiauto, lt bbl	160	0.055/.079	230	36,800	100	1,265.00	60	1,090.20			2,355.20
Gun, mach, 7.62-mm, (kit, MG, dual, hel)	7,480	0.055/.079	10	74,800			3,740	2,356.20	3,740	3,328.60	5,684.80

* M72 LAW is replacement ammunition.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	Total round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
Gun, mach, 7.62-mm (kit, MG, quad, hel)-----	14,700	0.055/.079	13	191,100			7,350	6,019.65	7,350	8,503.95	14,523.60
Kit ATGM (SS-11) hel-----	12	61/50	3	36			6	1,134.00	6	1,134.00	2,268.00
Kit Rkt 2.75-in., hel-----	96	18/27.2	3	288			48	2,592.00	48	2,592.00	5,184.00
											30,439.59 = 15.27 tons
ENGR BN (TOE 5-25E)											
Demolition kit, blasting, nonelec, w/explo-----		/150.00		39				5,850.00			5,850.00
Explosives (bulk)-----										3,900.00	3,900.00
Grenades, hand, frag-----		1.0/2.1		600			300	630.00	300	630.00	1,260.00
Mine, apers, M14-----		/0.49		1,800					1,800	882.00	882.00
Mine, at, M15-----		/49.00		300					300	14,700.00	14,700.00
Mine, at, M21-----		/22.70		100					100	2,270.00	2,270.00
Pistol, cal .45-----	21	.044/.057	117	2,457	21	108.11					108.11
Rifle, 7.62-mm, semiauto-----	160	0.055/.079	503	80,480	100	2,766.50	60	2,384.22			5,150.72
Gun, mach, 7.62-mm, lt wt, GP-----	3,080	.063/.089	47	144,760			1,760	7,362.08	1,320	5,521.56	12,883.64
Launcher, grenade, 40-mm-----	24	0.500/.806	67	1,608	6	201.00	6	324.01	12	648.02	1,173.03
Launcher, rocket, 3.5-in.-----	6	9/17.700	48	288			3	2,548.80	3	2,548.80	5,097.60
											53,275.10 = 26.64 tons
SIGNAL BN (TOE 11-215E)											
Grenades, hand, frag-----		1.0/2.1		300	200	262.60			100	231.00	493.60
Pistol, cal .45-----	21	.044/.057	24	504	21	22.18					22.18
Rifle, 7.62-mm, semiauto-----	100	0.055/.079	383	38,300	100	2,106.50					2,106.50
Gun, mach, 7.62-mm, lt wt, GP-----	2,640	.063/.089	5	13,200			1,760	780.00	880	390.00	1,170.00
Launcher, grenade, 40-mm-----	24	.500/.806	14	336	6	42.00	6	67.70	12	135.41	245.11
Launcher, rocket, 3.5-in.-----	6	9/17.700	9	54			3	477.00	3	477.00	954.00
											4,991.39 = 2.50 tons

MP COMPANY
(TOE 19-67E)

Grenade, hand, frag-----	160	1.0/2.1	200	150	196.60			50	115.50	312.10
Pistol, cal .45-----	31	.044/.057	43	1,333	21	39.73		10	24.51	64.24
Rifle, 7.62-mm semiauto-----	160	0.055/.079	111	17,760	100	610.50		60	526.14	1,136.64
*Rifle, 90-mm, on mount, M67-----	6	9.250/15	4	24	3	108.00		3	180.00	288.00
Launcher, grenade, 40-mm-----	24	0.500/.806	13	312	6	39.00		18	188.60	227.60
Gun, mach, 7.62-mm, lt wt, GP-----	2,640	.063/.089	6	15,840	880	468.00		1760	936.00	1,404.00

3,432.18 =
1.77 tons

HQ & HQ CO BAND, DIV SPT COMD
(TOE 29-52E)

Grenade, hand, frag-----		1.0/2.1	50	50	62.65					65.65
Pistol, cal .45-----	21	.044/.057	7	147	21	6.47				6.47
Rifle, 7.62-mm, semiauto-----	100	0.055/.079	74	7,400	100	407.00				407.00
Gun, mach, 7.62-mm, lt wt, GP-----	1,760	.063/.089	2	3,520			880	156.00	880	312.00

790.12 =
0.40 tons

ADMIN COMPANY
(TOE 12-157E)

Grenade, hand, frag-----		1.1/2.1	50					50	115.50	115.50
Pistol, cal .45-----	21	.044/.057	15	315	21	13.86				13.86
Rifle, 7.62-mm, semiauto-----	100	0.055/.079	298	29,800	100	1,639.00				1,639.00
Gun, mach, 7.62-mm, lt wt GP-----	1,760	.063/.089	15	26,400			880	1,170.00	880	2,340.00

4,108.36 =
2.05 tons

MED BN
(TOE 8-65E)

Pistol, cal .45-----	21	.044/.057	23	483	21	21.25				21.25
Rifle, 7.62-mm semiauto-----	100	0.055/.079	328	32,800	100	2,051.50				2,051.50

2,072.75 =
1.04 tons

SUPPLY AND TRANS BN
(TOE 29-45E)

Grenade, hand, frag-----		1.0/2.1	200			200	462.00			462.00
Pistol, cal .45-----	21	.044/.057	8	168	21	7.39				7.39
Rifle, 7.62-mm, semiauto-----	100	0.055/.079	388	38,800	100	2,134.00				2,134.00

* M72 LAW is replacement ammunition.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	Total round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
Gun, mach, 7.62-mm, lt wt, GP-----	1,760	.063/.089	8	14,080	-----	-----	880	624.00	880	624.00	1,248.00
Launcher, rocket, 3.5-in.-----	3	9/17.700	6	18	-----	-----	3	306.00	-----	-----	306.00
MAINT BN (TOE 29-15E)											4,157.39 = 2.08 tons
Grenade, hand, frag-----	-----	1.0/2.1	-----	100	-----	-----	100	231.00	-----	-----	231.00
Pistol, cal .45-----	21	.044/.057	14	294	21	12.94	-----	-----	-----	-----	12.94
Rifle, 7.62-mm, semiauto-----	100	0.055/.079	544	54,400	100	2,972.00	-----	-----	-----	-----	2,972.00
Gun, mach, 7.62-mm, lt wt, GP-----	1,760	.063/.089	16	28,160	-----	-----	880	1,248.00	880	1,248.00	2,496.00
Launcher, rocket, 3.5-in.-----	3	9/17.700	8	24	-----	-----	3	424.00	-----	-----	424.00
											6,135.94 = 3.07 tons

5-35. Ammunition Supply Data—Armored Division (TOE 17E)—Basic Load ²

a. Ammunition Supply Data.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb) 7	Total wpn	Total round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
HQ & HQ CO, ARMD DIV (TOE 17-4E)											
Flares, sig 1-----		1.5/3.18-----		60-----			60-----	90.00-----			90.00-----
Grenade, hand, colored smoke, M18-----		1.25/-----		8-----			8-----	10.00-----			10.00-----
Grenade, hand, frag 1-----		1.0/2.1-----		100-----					100-----	100.00-----	100.00-----
Grenade, hand, incd, AN-M1 4-----		2.00/-----		92-----			92-----	184.00-----			184.00-----
Grenade, hand, smoke, HC-----		1.50/-----		8-----			8-----	12.00-----			12.00-----
Gun, mach, cal .50, Bng, hv bbl, flex-----	500	0.390/.411-----	2	1,000-----			300-----	234.00-----	200-----	164.40-----	398.40-----
Gun, mach, 7.62-mm (OEM Carrier personnel, M114)-----	3,520	0.063/.089-----	3	10,560-----			2,640-----	704.88-----	880-----	234.96-----	939.84-----

Gun, mach, cal .50 (OEM, Carrier personnel, full-tracked, armd, M114)	1,000	0.390/.411	3	3,000			1,000	1,170.00		1,170.00
Pistol, semiauto, cal .45	21	.044/.057	31	651	21	28.64				28.64
Rifle, semiauto, 7.62-mm, lt bbl	340	0.055/0.079	111	37,740	100	550.00	120	732.60	120	1,052.28
Starter, fire, NP 3		0.06/		8			8	.48		.48
										5,268.28 =
										2.63 tons
MP CO (TOE 19-27E)										
Grenade, hand, colored smoke, M18		1.25/		64			64	80.00		80.00
Grenade, hand, incd, AN-M14		2.00/		116			116	232.00		232.00
Grenade, hand, irritant, CN-DM		1.063/		48			48	51.02		51.02
Grenade, hand, riot, CS1		/1.00		250			250	250.00		250.00
Grenade, hand, riot, DM1		/1.00		200			200	200.00		200.00
Grenade, hand, riot, CN1		/1.00		200			200	200.00		200.00
Grenade, hand, smoke, HC		1.50/		8			8	12.00		12.00
Grenade, hand, tear, CN		/2.20		112			112	246.40		246.40
Grenade, hand, tear, CS		/1.90		112			112	212.80		212.80
Gun, mach, 7.62-mm, lt-weight, GP	3,080	.063/.089	9	27,720			1,540	1,233.54	1,540	1,233.54
Launcher, grenade, 40-mm	30	0.500/.806	16	480	18	144.00	6	77.38	6	77.38
Pistol, semiauto, cal .45	21	.044/.056	169	3,549	21	156.16				
Revolver, cal .38	18		2	33		Negl.				Negl.
Rifle, semiauto, 7.62-mm, lt bbl	340	0.055/.079	104	35,360	100	572.00	120	985.92	120	985.92
Rifle, semiauto, 7.62-mm, lt bbl w/bipod	740	.055/.079	34	25,160	140	261.80	360	966.96	240	644.64
Rifle, 90-mm	18	9.250/15	9	162	6	499.50	6	675.00	6	675.00
Riot control agent, CN 1		/40.00		4			4	160.00		160.00
Riot control agent, CS 1		/48.00		4			4	192.00		192.00
Starter, fire, NP 3		0.06/		10			10	.60		.60
										34,060.92 =
										17.03 tons
AVIATION BN (TOE 1-75E)										
Arm subsys, hel, SS-11	18	61/150	3	54			6	1,098.00	12	5,400.00
Arm subsys, 7.62-mm, XM-2	3,900	.063/.089	10	39,000			1,300	819.00	2,600	2,314.00
Arm subsys, XM-3, 2.75	144	18/27.2	15	2,160			48	12,960.00	96	39,168.00
Arm subsys, 7.62-mm, Quad, M-6	21,600	.063/.089	13	813,800			7,200	5,896.80	14,400	16,660.80
Grenade, hand, colored smoke, M18		1.250/		180			180	225.00		225.00
Grenade, hand, frag 1		1.00/2.11		250			250	250.00		250.00
Grenade, hand, incd, AN-M1 4		2.00/		282			282	564.00		564.00
Grenade, hand, smoke, HC		1.50/		90			90	135.00		135.00
Gun, mach, 7.62-mm, lt weight, GP	3,080	.063/.089	6	18,480			2,200	831.60	880	469.92
										1,301.52

See footnotes at end of table.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	Total round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
Pistol, semiauto, cal .45	21	.044/.057	70	1,470	21	64.68					64.68
Rifle, semiauto, 7.62-mm, lt bbl	340	.055/.079	248	84,320	100	1,364.00	120	2,351.04	120	2,351.04	6,066.08
Starter, fire, NP 3		0.06/		18			18	1.08			1.08
JATO				200							
SIGNAL BN (TOE 11-35E)											92,923.90 = 46.46 tons
Grenade, hand, colored smoke, M18		1.25/		96			96	120.00			120.00
Grenade, hand, ined, AN-M14		2.00/		417			417	834.00			834.00
Grenade, hand, smoke, HC		1.500/		24			24	36.00			36.00
Gun, mach, 7.62-mm, lt weight, GP	3,080	.063/.089	3	9,240			2,200	415.80	880	234.96	650.76
Gun, mach, Cal .50, Bng, hv bbl, flex	500	0.390/.411	10	5,000			300	1,170.00	200	822.00	1,992.00
Launcher, grenade, 40-mm	30	.500/.806	17	510	18	153.00	6	82.21	6	82.21	317.42
Launcher, rocket, 3.5 in.	9	9/17.700	26	234			6	2,761.20	3	1,380.60	4,141.80
Pistol, semiauto, cal .45	21	.044/.057	32	672	21	29.57					29.57
Rifle, semiauto, 7.62-mm, lt bbl	340	.055/.079	543	184,620	100	2,986.50	120	5,147.64	120	5,147.64	13,281.78
Starter, fire, NP 3		0.06/		24			24	1.44			1.44
3 HQ & HQ CO BRIGADE (TOE 17-42E)											21,404.77 = 10.70 tons
Armament subsys, hel, 7.62-mm, XM-2	3,900	.063/.089	6	23,400			1,300	491.40	2,600	1,388.40	1,879.80
Flares, surface, trip, M49 ¹		1.5/3.18		188			188	282.00			282.00
Grenade, hand, colored smoke, M18		1.25/		32			32	40.00			40.00
Grenade, hand, frag ¹		1.00/2.10		108			108	108.00			108.00
Grenade, hand, ined, AN-M14		2.00/		123			123	246.00			246.00
Grenade, hand, smoke, HC		1.50/		8			8	12.00			12.00
Gun, mach, cal .50, Bng, hv bbl, flex	500	0.390/.411	3	1,500			500	585.00			585.00
Gun, mach, cal .50, Bng, hv bbl, flex, (OEM Carrier personnel M114)	1,000	0.390/.411	3	3,000			1,000	1,170.00			1,170.00
Gun, mach, cal .50, Bng, hv bbl flex, (OEM Recovery veh, lt)	500	0.390/.411	1	500			500	195.00			195.00
Gun, mach, 7.62-mm (OEM Carrier personnel, M114)	3,520	.063/.089	3	10,560			2,640	704.88	880	234.96	939.84
Gun, submach, cal .45	180	.044/.057	2	360			180	15.84			15.84
Launcher, grenade, 40-mm	30	.500/.806	5	150	18	45.00	6	24.18	6	24.18	93.36

Launcher, rkt, 3.5-in.-----	9	9/17.700	6	54			6	637.20	3	318.60	955.80
Pistol, semiauto, cal .45-----	21	.044/.057	33	693	21	30.49					30.49
Rifle, semiauto, 7.62-mm lt bbl-----	340	.055/.079	103	35,020	100	566.50	240	1,952.88			2,519.38
Starter, fire, Np 3-----		0.06/		8			8	0.48			0.48
											9,072.99 =
											4.54 tons
6 TK BN (TOE 17-35E)											
Dml eqp set, explo, initiating, nonelec, W explo-----		110.000	1				110	110.00			110.00
Flares, surface, trip, M49 ¹ -----		1.500/3.18		1,088			1,088	1,632.00			1,632.00
Grenade, hand, colored smoke, M18-----		1.25/		128			128	160.00			160.00
Grenade, hand, frag ¹ -----		1.00/2.10		1,040			1,040	1,040.00			1,040.00
Grenade, hand, incd, AN-M14-----		2.00/		379			379	758.00			758.00
Grenade, hand, smoke, HC-----		1.50/		32			32	48.00			48.00
Gun, mach, 7.62-mm, lt-weight, GP-----	3,080	0.063/0.089	5	15,400			2,200	693.00	880	391.60	1,084.60
Gun, mach, 7.62-mm, lt-weight (OEM tk, med gun)-----	6,500	0.063/0.089	54	351,000			5,000	17,010.00	1,500	7,209.00	24,219.00
Gun, mach, 7.62-mm (OEM Carrier personnel, M114)-----	3,520	.063/.089	5	17,600			2,640	831.60	880	391.60	1,223.20
Gun, mach, cal .30, lt-weight (OEM Tk, lt gun)-----	6,000	.086/.098	2	12,000			5,000	860.00	1,000	196.00	1,056.00
Gun, mach, cal .50, bng, hv bbl flex-----	500	0.390/.411	22	11,000			300	2,574.00	200	1,808.40	4,382.40
Gun, mach, cal .50 (OEM mortar 4.2-in)-----	2,000	0.390/.411	4	8,000			600	936.00	1,400	2,301.60	3,237.60
Gun, mach, cal .50 (OEM carrier, per- sonnel, full-tracked)-----	2,100	0.390/.411	12	25,200			2,000	9,360.00	100	493.20	9,853.20
Gun, mach, cal .50 (OEM tk recov veh, med)-----	1,600	0.390/.411	5	8,000			1,500	2,925.00	100	205.50	3,130.50
Gun, mach, cal .50 (OEM tk, cbt, 76-mm)-----	700	0.390/.411	2	1,400			600	468.00	100	822.00	1,290.00
Gun, mach, cal .50 (OEM tk, med gun)-----	1,260	0.390/.411	54	68,040			900	18,954.00	360	7,989.84	26,943.84
Gun, mach, cal .50 (OEM recov veh, lt tracked)-----	600	0.390/.411	1	600			500	195.00	100	41.10	236.10
Gun, mach, cal .50 (OEM carrier per- sonnel, M114)-----	1,400	0.390/.411	5	7,000			1,000	1,950.00	400	822.00	2,772.00
Gun, submach, cal .45-----	180	.044/.057	124	22,320			180	982.08			982.08
Gun, tk, 76-mm-----	70	25.8/42.05	2	140			65	3,354.00	5	420.50	3,774.50
Gun, tk, 105-mm-----	78	45.211/60.0	54	4,212			63	153,807.82	15	48,600.00	202,407.82
Launcher, grenade, 40-mm-----	30	.500/.806	15	450	18	135.00	6	72.54	6	72.54	280.08
Mortar, 4.2-in., SP full tracked-----	163	26/41	4	652			93	9,672.00	70	11,480.00	21,152.00
Mine, apers, M14-----		/0.49		450					450	220.50	220.50
Mine, apers, M16-----		/11.25		52					52	585.00	585.00
Mine, apers, M18-----		3.2/6.8		188			94	300.8	94	639.20	940.00
Mine, at, M21-----		/22.70		200					200	4,540.00	4,540.00

See footnotes at end of table.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb) ⁷	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
Pistol, semiauto, cal .45-----	21	.044/.057	328	6,888	21	303.07					303.07
Rifle, semiauto, 7.62-mm, lt bbl-----	340	.055/.079	246	83,640	100	1,353.00	120	2,494.44	120	2,494.44	6,341.88
Rifle, semiauto, 7.62-mm, lt bbl w/ bipod-----	740	.055/.079	2	1,480	160	17.60	380	60.04	200	31.60	109.24
Starter, fire, NP 3-----		0.06/		40			40	2.40			2.40
											324,815.01 = 162.40 tons
5 MECH INF BN (TOE 7-45E)											
Dml eqp set, explo, initiating, elec- nonelec, w explo-----		/110.00		4			4	440.00			440.00
ENTAC ³ -----	15	37.5/82	3	45	³ 4	450.00	11	2,706.00			3,156.00
Flares, surface trip, M49 ¹ -----		1,500/3.18		804			804	1,206.00			1,206.00
Grenade, hand & rifle, smoke, WP-----		1.70/		144			144	244.80			244.80
Grenade, hand, colored smoke, M18-----		1.25/		144			144	180.00			180.00
Grenades, hand, frag ¹ -----		1.00/2.10		1,512			1,512	1,512.00			1,512.00
Grenade, hand, incd, AN-M14-----		2.00/		144			144	288.00			288.00
Grenade, hand, smoke, HC-----		1.50/		144			144	216.00			216.00
Gun, Mach, 7.62-mm, lt-weight, GP-----	3,080	.063/.089	50	145,000	1,760	5,544.00	440	1,958.00	880	3,916.00	11,418.00
Gun, mach, 7.62-mm (OEM, carrier, personnel, full-tracked, armd, M114)-----	3,520	.063/.089	14	49,280			2,640	2,328.48	880	1,096.48	3,424.96
Gun, mach, cal .30, (OEM, 76-mm tk)-----	6,000	.086/.098	2	12,000			5,000	860.00	1,000	196.00	1,056.00
Gun, mach, cal .50, Bng, hv bbl, flex-----	500	.390/.411	24	12,000			400	3,744.00	100	986.40	4,730.40
Gun, mach, cal .50 (OEM-Mortar 4.2- in. SP)-----	2,000	.390/.411	4	8,000			600	936.00	1,400	2,301.60	3,237.60
Gun, mach, cal .50 (OEM-Carrier Per- sonnel, M113)-----	2,100	.390/.411	48	100,800			2,000	37,440.00	100	1,972.80	39,412.80
Gun, mach, cal .50 (OEM M-114)-----	1,400	.390/.411	10	14,000			1,000	3,900.00	400	1,644.00	5,544.00
Gun, mach, cal .50 (OEM-Tk, combat 76-mm gun)-----	700	.390/.411	2	1,400			600	468.00	100	82.00	550.20
Gun, mach, cal .50 (OEM-Recov Veh, lt)-----	600	.390/.411	5	3,000			500	975.00	100	205.50	1,180.50
Gun, mach, cal .50, (OEM-81-mm mortar, SP)-----	2,000	.390/.411	9	18,000			600	2,106.00	1,400	5,178.50	7,284.50
Gun, submach, cal .45-----	180	.044/.057	14	2,520			180	110.88			110.88
Gun, tank, 76-mm-----	70	25.8/42.05	2	140			65	3,354.00	5	420.50	3,774.50
Ignition cylinder flamethrower-----		/0.375		36			36	13.50			13.50
Launcher, grenade, 40-mm-----	30	.500/.806	89	2,850	18	801.00	6	430.40	6	430.40	1,661.80

Launcher, rocker, 3.5-in.	9	9/17.7	19	171			6	2,017.80	3	1,008.90	3,026.70
Mine, apers, M14		/ .49		450					450	221.00	221.00
Mine, apers, M16		/11.25		52					52	585.00	585.00
Mine, apers, M18		3.2/6.8		198			140	952.00	58	396.00	1,348.00
Mine, at, M21		18/20.5		680			480	23,520.00	200	9,800.00	33,320.00
Mortar, 81-mm, SP, full-tracked	155	11.4/13.250	9	1,395			120	12,312.00	35	4,173.75	16,485.75
Mortar, 4.2-in., SP, full-tracked	163	26/41	4	652			93	9,672.00	70	11,480.00	21,152.00
Pistol, semiauto, cal .45	31	.044/.057	259	8,029	21	239.32			10	147.63	386.95
Rifle, semiauto, 7.62-mm, lt bbl	340	.055/.079	586	209,240	100	3,223.00	120	5,555.28	120	5,555.28	14,333.56
Rifle, semiauto, 7.62-mm, lt bbl w/ bipod	740	.055/.079	56	41,440	140	431.20	360	1,592.64	240	1,061.76	3,085.60
Rifle, 90-mm, M67	18	9.250/15.0	18	324	6	990.00	6	1,620.00	6	1,620.00	4,239.00
Rifle, 106-mm, M40A1	40	44/60	6	240			16	4,224.00	24	8,640.00	12,864.00
Smoke pot, HC, 30 lb		30.00/		18			18	540.00			540.00
Starter, fire, NP 3		.06/		36			36	2.16			2.16
Thickener, incd oil (2 lb)		2/		36			36	72.00			72.00
ENGR BN ⁸ (TOE 5-145E)											
202,304.16 = 101.15 tons											
Dml eqp set, explo, initiating, elec- nonelec, W explo		/110.00		50			50	5,500.00			5,500.00
Explosives								7,200.00		8,840.00	16,040.00
Flares, surface, trip, M49 ¹		1.50/3.18		652			652	978.00			978.00
Grenade, hand, colored smoke, M18		1.25/		192			192	240.00			240.00
Grenade, hand, frag ¹		1.00/2.1		932			932	932.00			932.00
Grenade, hand, incd, AN-M14		2.00/		619			619	1,238.00			1,238.00
Grenade, hand, smoke, HC		1.50/		48			48	72.00			72.00
Gun, dml, 165-mm (OEM Cbt Engr Veh)	30	67/	8	240			30	16,080.00			16,080.00
Gun, mach, 7.62-mm, lt weight, GP	3,080	.063/.089	15	46,200			2,200	2,079.00	880	1,174.80	3,253.80
Gun, mach, 7.62-mm (OEM, combat enr veh)	2,000	.063/.089	8	16,000			2,000	1,008.00			1,008.00
Gun, mach, cal .50, (OEM, carrier, pers, FT)	2,100	.390/.411	41	86,100			2,000	31,980.00	100	1,685.10	33,665.10
Gun, mach, cal .50, (OEM, Tk recov veh, M88)	1,600	.390/.411	2	3,200			1,500	1,170.00	100	82.20	1,252.20
Gun, mach, Cal .50 (OEM, Cmbt enr veh, F. T.)	600	.390/.411	8	4,800			600	1,872.00			1,872.00
Launcher, grenade, 40-mm	30	.50/.806	89	2,670	18	801.00	6	430.40	6	430.40	1,661.80
Launcher, Rkt, 3.5-in.	15	9/17.7	65	975			9	10,354.50	6	6,903.00	17,257.50
Mine, apers, M14		/0.49		4,230			3,240	1,587.60	990	485.10	2,072.70
Mine, apers, M16		/11.25		680			480	5,400.00	200	2,250.00	7,650.00

See footnotes at end of table.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb) ⁷	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
Mine, apers, M18		3.2/6.8		1,000			500	3,400.00	500	3,400.00	6,800.00
Mine, AT, M15		/49.00		1,830			1,000	49,000.00	820	40,180.00	89,180.00
Mine, AT, M21		18/20.5		915			600	12,300.00	310	6,355.00	18,655.00
Pistol, auto, cal .45	21	.044/.057	172	3,612	21	158.93					158.93
Rifle, semiauto, 7.62-mm, lt bbl ⁸	340	.055/.079	783	266,220	100	4,306.50	120	7,422.84	120	7,422.84	19,152.18
Rifle, semiauto, 7.62-mm, lt bbl w/ bipod	740	.055/.079	104	76,960	140	800.80	360	2,957.76	240	1,971.84	5,730.40
Smoke pot, floating, AN-M7		/37.00		100					100	3,700.00	3,700.00
Smoke pot, HC, 30 lb		30.00/		156			156	4,680.00			4,680.00
Starter, fire, NP 3		0.06/		34			34	2.04			2.04
ARMD CAV SQDN (TOE 17-105E)											258,831.65 = 129.42 tons
Arm subsys, hel, 7.62-mm, XM-2	6,500	.063/.089	9	58,500			1,300	737.10	5,200	4,165.20	4,902.30
Arm subsys, hel, XM-3	192	18/27.2	4	768			48	3,456.00	144	15,667.20	19,123.20
Arm subsys, hel, 7.62-mm, quad, XM-6	21,600	.063/.089	9	194,400			7,200	453.60	14,400	11,534.40	11,988.00
Arm subsys, hel, SS-11	36	61/150	4	144			6	1,464.00	30	18,000.00	19,464.00
Dml eqp set, explo, initiating, elec- nonelec, W explo		/110.00	9				9	990.00			990.00
Flares, surface, trip, M49 ¹		1.5/		1,188			1,188	1,782.00			1,782.00
Grenade, hand, colored smoke, M18		1.25/		252			252	315.00			315.00
Grenade, hand, frag ¹		1.00/2.10		1,912			1,912	1,912.00			1,912.00
Grenade, hand, incd, AN-M14		2.00/		525			525	1,050.00			1,050.00
Grenade, hand & rifle, smoke, WP		1.70/		48			48	81.60			81.60
Grenade, hand, smoke, HC		1.5/		48			48	72.00			72.00
Gun, mach, 7.62-mm, lt weight, GP	3,080	0.063/.089	13	40,040			2,200	1,801.80	880	1,018.16	2,819.96
Gun, mach, 7.62-mm (OEM M114)	3,520	.063/.089	50	176,000			2,640	8,316.00	880	3,916.00	12,232.00
Gun, mach, cal .30, lt weight, GP, (OEM Tk, lt gun, M41)	6,000	.063/.089	18	90,000			5,000	5,670.00	1,000	1,602.00	7,272.00
Gun, mach, cal .50, Bng, hv bbl, flex	500	0.390/0.411	32	16,000			300	3,744.00	200	2,630.40	6,374.40
Gun, mach, cal .50, Bng, (OEM, Mortar, 4.2 in.)	2,000	0.390/0.411	9	18,000			600	2,106.00	1,400	5,178.60	7,284.60
Gun, mach, cal .50, Bng, (OEM M113)	2,100	0.390/0.411	25	52,500			2,000	19,500.00	100	1,027.50	20,527.50
Gun, mach, cal .50, Bng (OEM Tk, lt gun)	700	0.390/0.411	18	12,600			600	4,212.00	100	739.80	4,951.80
Gun, mach, cal .50, (OEM veh, recovery, lt armed)	600	0.390/0.411	5	3,000			500	975.00	100	205.50	1,180.50

Gun, mech, cal .50, (OEM M114)	1,400	.390/.411	50	70,000			1,000	19,500.00	400	8,220.00	27,720.00
Gun, submach, cal .45	180	.044/.057	47	8,460			180	372.24			372.24
Gun, tank, 76-mm (OEM)	70	25.80/42.05	18	1,260			65	30,186.00	5	378.45	30,564.45
Launcher, grenade, 40-mm	30	0.500/0.806	81	2,430	18	729.00	6	391.72	6	391.72	1,512.44
Mine, apers, M14		/0.49		450			450	220.50			220.50
Mine, apers, M16		/11.25		52			52	585.00			585.00
Mine, AT, M21		/22.70		346					346	7,854.20	7,854.20
Mine, apers, M18		3.2/6.8		198					198	1,346.40	1,346.40
Mortar, SP, 4.2 in. (OEM)	163	26/41.0	9	1,467			93	21,762.00	70	25,830.00	47,592.00
Pistol, cal .45	21	.044/.057	304	6,384	21	280.90					280.90
Rifle, semiauto, 7.62-mm, lt bbl	340	.055/.079	513	174,420	100	2,618.00	120	4,863.24	120	4,863.24	12,344.48
Rifle, semiauto, 7.62-mm, w/bipod	740	.055/.079	26	19,240	160	.228.80	380	780.52	200	410.80	1,420.12
Starter, fire, NP 3		0.06/		42			42	2.52			2.52
256,138.11 = 128.13 tons											
HQ & HQ BTRY, DIV ARTY (TOE 6-302E)											
Armament subsystem, hel, 7.62-mm XM 2	3,900	.063/.089	6	39,000			1,300	491.40	2,600	1,388.40	1,879.80
Grenade, hand, colored smoke, M18		1.25/		48			48	60.00			60.00
Grenade, hand, frag 1		1.00/2.10		160			160	336.00			336.00
Grenade, hand, incd, AN-M14		2.00/		180			180	360.00			360.00
Grenade, hand, smoke, HC		1.5/		24			24	36.00			36.00
Gun, mach, 7.62-mm, lt weight, GP	1,760	.063/.089	10	17,600			880	554.40	880	783.20	1,337.60
Launcher, Grenade, 40-mm	26	.500/.806	4	104			8	16.00	18	59.64	75.64
Launcher, rkt, 3.5-in.	6	9/17.7	7	42			3	189.00	3	371.70	560.70
Pistol, auto, cal .45	21	.044/.057	34	714	21	314.16					314.16
Rifle, semiauto, 7.62-mm, lt bbl	160	.055/.079	169	27,040	100	929.50	60	801.00			1,730.56
Smoke, pot, HC, 30 lb		30.00/		6			6	180.00			180.00
Starter, fire, NP 3		0.06/		12			12	0.72			0.72
6,877.18 = 3.43 tons											
3 FA BN 155-MM SP (TOE 6-365E)											
Gun, mach, cal .50 (OEM, 155-mm how)	600	.390/.411	18	10,800			500	3,510.00	100	739.80	4,249.80
Gun, mach, cal .50 (OEM recovery vehicle, tracked)	600	.390/.411	2	1,200			500	390.00	100	82.20	472.20
Gun, mach, 7.62-mm lt wt	1,760	.063/.089	32	66,320			380	1,774.08	880	2,506.24	4,280.32
Howitzer, 155-mm, SP, M109	275	129.3/133.2	18	2,700			28	65,167.20	247	592,207.20	657,374.40
Launcher, grenade, 40-mm	26	.500/.806	35	910			8	140.00	18	315.00	455.00

See footnotes at end of table.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb) ⁷	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
Launcher, rkt, multiple, 115-mm ⁶ -----	90	93.33	3	270	-----	-----	-----	-----	(270)	-----	Do not include in total ⁶
Launcher, rkt, 3.5-inch-----	6	9/17.7	20	120	-----	-----	3	540.00	3	1,062.00	2,602.00
Pistol, auto, cal .45-----	21	.044/.057	68	1,428	21	62.83	-----	-----	-----	-----	62.83
Rifle, semiauto, 7.62-mm, lt bbl-----	160	.055/.079	475	76,000	100	2,612.50	60	2,251.50	-----	-----	4,864.00
											173,360.55 = 86.68 tons
FA BN, 155-MM/8-1N. SP (TOE 6-355E)											
Grenade, hand, colored smoke, M18-----	-----	1.25/	-----	192	-----	-----	192	240.00	-----	-----	240.00
Grenade, hand frag ¹ -----	-----	1.00/2.10	-----	376	-----	-----	376	789.60	-----	-----	789.60
Grenade, hand, incd, AN-M14-----	-----	2.00/	-----	293	-----	-----	293	586.00	-----	-----	586.00
Grenade, hand, smoke, HC-----	-----	1.50/	-----	48	-----	-----	48	72.00	-----	-----	72.00
Gun, mach, 7.62-mm, lt weight, GP-----	1,760	.063/.089	23	40,480	-----	-----	880	1,275.12	880	1,801.36	3,076.48
Gun, mach cal .50, (OEM 155-mm How, SP)-----	600	.390/.411	18	10,800	-----	-----	500	3,510.00	100	739.80	4,249.80
Gun, mach, cal .50 (OEM tk recov. veh, Med)-----	1,600	.390/.411	1	1,600	-----	-----	1,500	585.00	100	41.10	626.10
Gun, mach, cal .50 (OEM recov veh, lt tracked)-----	600	.390/.411	1	600	-----	-----	500	195.00	100	411.00	606.00
Howitzer, 155-mm, SP, M109-----	150	129.3/133.2	18	2,700	-----	-----	28	65,167.20	122	292,507.20	356,674.40
Howitzer, 8-in., SP (OEM)-----	100	256./266.	4	400	-----	-----	2	2,048.00	98	104,272.00	106,320.00
Launcher, Grenade, 40-mm-----	26	.500/.806	25	650	-----	-----	8	100.00	18	362.70	462.70
Launcher, rkt, 3.5-in-----	6	9/17.7	33	198	-----	-----	3	891.00	3	1,752.30	2,643.30
Pistol, auto, cal .45-----	21	.044/.057	50	1,050	21	46.20	-----	-----	-----	-----	46.20
Rifle, semiauto, 7.62-mm, lt bbl-----	160	.055/.806	546	87,360	100	3,003.00	60	2,588.00	-----	-----	5,591.04
Smoke pot, HC, 30 lb-----	-----	30.00/	-----	24	-----	-----	24	720.00	-----	-----	720.00
Starter, fire, NP 3-----	-----	0.06/	-----	36	-----	-----	36	2.16	-----	-----	2.16
											483,705.78 = 241.85 tons
FN BN, HJ (TOE 6-175E)											
Grenade, hand, colored smoke, M18-----	-----	1.25/	-----	96	-----	-----	96	120.00	-----	-----	120.00
Grenade, hand, frag ¹ -----	-----	1.00/2.10	-----	100	-----	-----	100	210.00	-----	-----	210.00
Grenade, hand, incd, AN-M14-----	-----	2.000/	-----	192	-----	-----	192	384.00	-----	-----	384.00
Grenade, hand, smoke, HC-----	-----	1.50/	-----	24	-----	-----	24	36.00	-----	-----	36.00

Gun, mach, 7.62-mm, lt-weight, GP	1,760	.063/.089	19	33,440			880	1,053.36	880	1,488.08	2,541.44
Launcher, grenade, 40-mm	26	.500/.806	13	338			8	52.00	18	188.60	240.60
Launcher, rkt, 3.5-in	6	9/17.7	20	120			3	540.00	3	1,062.00	1,602.00
Launcher, 762-mm rkt, trk-mtd	4	6,060.00/	4	16			4	96,960.00			96,960.00
Pistol, auto, cal .45	21	.044/.057	27	567	21	24.95					24.95
Rifle, semiauto, 7.62-mm, lt bbl	160	.055/.079	218	34,880	100	1,199.00	60	1,033.30			2,232.30
Smoke pot, HC, 30 lb		30.00/		12			12	360.00			360.00
Starter, fire, NP3		0.06/		24			24	1.44			1.44
HQ & HQ CO & BAND, SPT COMD (TOE 29-2E)											107,979.75= 53.98 tons
Grenade, hand, colored smoke, M18		1.25/		32			32	42.00			42.00
Grenade, hand, incd, AN-M14		2.00/		40			40	80.00			80.00
Grenade, hand, smoke, HC		1.50/		8			8	12.00			12.00
Gun, mach, 7.62-mm, lt weight, GP	3,080	.063/.089	2	6,160			2,200	277.20	880	156.64	433.84
Pistol, auto, cal .45	21	.044/.057	9	189	21	8.32					8.32
Rifle, semiauto, 7.62-mm, lt bbl	340	.055/.079	86	29,240	100	473.00	120	815.26	120	815.26	2,103.72
Starter, fire, NP 3		0.06/		6			6	.36			.36
ADMIN CO (TOE 12-37E)											2,680.24= 1.34 tons
Grenade, hand, colored smoke, M18		1.25/		32			32	40.00			40.00
Grenade, hand, incd, AN-M14		2.00/		80			80	160.00			160.00
Grenade, hand, smoke, HC		1.50/		8			8	120.00			120.00
Gun, mach, 7.62-mm, lt weight, GP	3,080	.063/.089	15	46,200			2,200	2,079.00	880	1,174.80	3,253.80
Pistol, auto, cal .45	21	.044/.057	15	315	21	13.64					13.64
Rifle, semiauto, 7.62-mm, lt bbl	340	.055/.079	317	107,780	100	1,743.50	120	3,005.16	120	3,005.16	7,753.82
Starter, fire, NP 3		0.06/		6			6	.36			.36
MED BN (TOE 8-35E)											11,341.62= 5.67 tons
Grenade, hand, colored smoke, M18		1.25/		128			128	160.00			160.00
Grenade, hand, incd, AN-M14		2.00/		266			266	532.00			532.00
Grenade, hand, smoke, HC		1.50/		32			32	48.00			48.00
Pistol, auto, cal .45	21	.044/.057	23	483	21	21.25					21.25

See footnotes at end of table.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb) ⁷	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
Rifle, semiauto, 7.62-mm, lt bbl-----	340	.055/.079	373	126,820	100	2,051.50	120	3,536.04	120	3,536.04	9,123.58
Starter, fire, NP 3-----		0.06/		18			18	1.08			1.08
SUP & TRANS BN (TOE 29-65E)											9,885.91 = 4.98 tons
Grenade, hand, colored smoke, M18-----		1.25/		96			96	120.00			120.00
Grenade, hand, incd-----		2.00/		405			405	810.00			810.00
Grenade, hand, smoke, HC-----		1.50/		24			24	36.00			36.00
Gun, mach, 7.62-mm, lt-weight, GP-----	3,080	.063/.089	29	89,320			2,200	4,019.40	880	6,970.48	10,989.88
Launcher, rkt, 3.5-in-----	9	9/17.7	8	72			6	849.60	3	424.80	1,274.40
Pistol, auto, cal .45-----	21	.044/.057	8	168	21	7.39					7.39
Rifle, semiauto, 7.62-mm, lt bbl-----	340	.055/.079	434	147,560	100	2,387.00	120	4,114.32	120	4,114.32	10,615.64
Rifle, semiauto, 7.62-mm, lt bbl w/bipod-----	740	.055/.079	4	2,960	140	30.80	360	113.76	240	75.84	220.40
MAINT BN (TOE 29-35E)											24,764.91 = 12.38 tons
Grenade, hand, colored smoke, M18-----		1.25/		160			160	200.00			200.00
Grenade, hand, frag ¹ -----		1.00/2.10		32			32	67.20			67.20
Grenade, hand, incd, AN-M14-----		2.00/		630			630	126.00			126.00
Grenade, hand, smoke, HC-----		1.5/		40			40	600.00			600.00
Gun, mach, 7.62-mm, lt weight, GP-----	3,080	.063/.089	16	49,280			2,200	2,217.60	880	1,253.12	3,470.72
Gun, mach, cal .50 (OEM Tk Recov veh, Med)-----	1,600	.390/.411	4	6,400			1,500	2,340.00	100	164.40	2,504.40
Launcher, rkt, 3.5-in-----	9	9/17.7	13	117			6	1,380.60	3	690.30	2,070.90
Pistol, Auto, cal .45-----	21	.044/.057	22	462	21	20.33					20.33
Rifle, semiauto, 7.62-mm, lt bbl-----	340	.055/.079	885	300,900	100	4,867.50	120	8,389.80	120	8,389.80	21,647.10
Starter, fire, NP 3-----		0.06/		32			32	1.92			1.92
											30,708.57 = 15.35 tons

¹ The following vehicles have been used as standard for this paragraph. In addition to the main armament, the following quantities of ammunition should be provided as indicated:

Combat vehicle	Number of rd MG cal .50	Number of rd MG 7.62-mm	Number of grenades hand, frag	Number of flares
Carrier, command post, M577	-----	-----	20	12
Carrier, pers, M113	2,100	-----	20	12
Carrier, pers, M114	1,400	2,640	20	12
Combat, engr vehicle, T118	600	2,000	8	--
Howitzer, lt, SP, 105-mm, M108	600	-----	12	--
Howitzer, SP, 155-mm, M109	600	-----	8	--
Howitzer, SP, 8-in., M110	-----	-----	8	--
Launcher, M60 tk chassis, for armd veh launched brg	-----	-----	8	16
Mortar, SP, 81-mm, T257E1	2,000	-----	12	--
Mortar, SP, 4.2-in., M106	2,000	-----	12	--
Recovery vehicle, lt, M578	600	-----	8	16
Tk, combat, lt gun, M41A3	700	6,000	8	12
Tk, combat, med gun, M60A1	1,260	6,500	8	12
Tk, recovery vehicle, med, M88	1,600	-----	8	16

² This paragraph is based on E-series TOE without augmentation.

³ ENTAC missiles are transported 4 each on weapons carrier, 11 each on $\frac{3}{4}$ -ton truck organic to Bn Antitank platoon.

⁴ Weights of ammunition for tank main armament based on 76-mm HE for M41A3 tank and 105-mm HEP-T for M60A1 tank.

⁵ 4 Rockets, 762-mm, M31A1C (Honest John) are carried on 4 Handling Units, 762-mm Rocket, Trailer Mounted in each firing battery.

⁶ Additional transportation must be requested to carry basic load for Launchers, Rocket, 115-mm, when employed.

⁷ On all charts, weights per round left of diagonal line (/) indicates unpackaged weight; right of line, packaged weight of items.

⁸ Engineer battalion data is for those divisions equipped with Mobile Assault Bridge. Add 5 Rifles, 7.62-mm semiauto, to engineer battalion of divisions equipped with M4T6 bridging.

b. Weight of Armored Division (TOE 17E) Basic Load of Ammunition (Based on type combat vehicles).

	1	2	3	4	5	6
1	Unit	TOE	Wt of basic load for TOE weapons, mines, and demolitions (tons)	Wt of basic load for on-vehicle armament (tons)	Total wt of unit basic load (tons)	Total wt for div (tons)
2	HQ & HQ co, armd div	17-4E	1.58	1.05	2.63	2.63
3	MP CO	19-27E	16.69	0.00	16.69	16.69
4	Avn bn	1-75E	4.30	42.16	46.46	46.46
5	Sig bn	11-35E	10.70	0.00	10.70	10.70
6	3 HQ & HQ co, Bde	17-42E	2.45	2.09	4.54	13.62
7	6 tk bn	17-35E	11.75	150.65	162.40	974.40
8	5 inf bn (mech)	7-45E	42.28	60.10	102.38	511.90
9	Engr bn	5-145E	17.10	119.33	136.43	136.43
10	Armd cav sqdn	17-105E	20.52	79.34	99.86	99.86
11	HQ & HQ Btry, divarty	6-302E	3.95	.94	4.89	4.89
12	3 FA bn, 155-mm, SP	6-365E	3.91	280.62	284.53	853.59
13	FA bn, 155-mm/8-in. SP	6-355E	12.30	213.61	225.91	225.91
14	FA bn, HJ	6-175E	56.42	0.00	56.42	56.42
15	HQ & HQ co & band, spt comd	29-2E	1.34	0.00	1.34	1.34
16	Admin co	12-37E	5.67	0.00	5.67	5.67
17	Med bn	8-35E	4.98	0.00	4.98	4.98
18	Sup & trans bn	29-65E	12.04	0.00	12.04	12.04
19	Maint bn	29-35E	14.10	1.25	15.35	15.35
20	Total armd div		242.08	951.14		2,992.88

5-36. Ammunition Supply Data—Infantry Division Basic Load (TOE 7E)

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
HQ & HQ CO, INF DIV (TOE 7-4E)											
Grenade, hand, frag-----		1.0/2.1		100			100	231.00			231.00
Pistol, cal .45-----	21	.044/.057	27	567	21	25.00					25.00
Rifle, 7.62-mm, semiauto, lt bbl-----	100	0.055/.079	110	11,000	100	605.00					605.00
Gun, mach, Cal .50, hv bbl-----	525	0.390/.411	2	1,050			315	231.00	210	172.62	418.32
											1,279.32 = 0.64 tons
HQ & HQ CO, INF DIV BDE (TOE 7-42E)											
Flare, surface, trip, M49-----		1.500/3.18		32			16	50.90	16	50.90	100.18
Grenade, hand, frag-----		1.0/2.1		100			100	231.00			231.00
Pistol, cal .45-----	21	.044/.057	27	567	21	24.95					24.95
Rifle, 7.62-mm, semiauto, lt bbl-----	160	0.055/.079	92	14,720	100	506.00	60	436.08			942.08
Gun, mach, 7.62-mm (kit, MG dual, hel)-----	7,480	0.063/.089	6	44,880			3,740	1,413.72	3,740	1,997.16	3,410.88
Gun, mach, cal .50, Bng, hv bbl-----	630	0.390/.411	3	1,890			420	517.80	210	258.90	776.70
Launcher, grenade, 40-mm-----	24	0.500/.806	5		6	15.00	18	72.54			87.54
Launcher, rocket, 3.5-in-----	6	9/17.700	6		3	318.60			3	318.60	637.20
											6,209.53 = 3.11 tons
INF BN (TOE 7-15E)											
Demolition kit, blasting, elec-nonelec, w/explo-----		150.00/		3		450.00					450.00
Flare, surface, trip, M49-----		1.500/3.18		80			80	254.50			254.50
Grenade, hand, frag-----		1.0/2.1		1,600					1,600	3,696.00	3,696.00
Demo kit, blasting, nonelec-----		150.000/		1		150.00					150.00
Ignition cylinder, flamethrower-----		/0.375		36			36	13.50			13.50
Thickener, inced oil, 2-lb can-----		2/		36			36	72.00			72.00
Pistol, cal .45-----	31	.044/.057	239	7,409	21	220.83			10	136.23	357.06
Rifle, 7.62-mm, semiauto, lt bbl-----	340	0.055/.079	535	181,900	100	2,942.50	120	5,071.80	120	5,071.80	13,086.10
Rifle, 7.62-mm, modified-----	740	0.055/.079	56	41,400	160	492.80	380	1,681.12	200	884.80	3,058.72
Gun, mach, 7.62-mm, lt wt, GP-----	3,080	0.063/.089	25	77,000	880	1,950.00	1,320	2,925.00	880	1,950.00	6,825.00

Gun, mach, cal .50, Bng, hv bbl	630	0.390/.411	13	8,190	420	2,243.80			210	1,121.90	3,365.70
Rifle, spotting, cal .50 (recoilless rifle 106-mm)	220	3.2/4.11	8	1,760	110	352.00			110	452.10	804.10
Rifle, 90-mm, on mount, M67	18	9.250/15.0	18	324	6	999.00	6	1,620.00	6	1,620.00	4,239.00
Rifle, 106-mm, on mount	40	40/60	8	320	6	2,112.00	10	4,760.00	24	11,424.00	18,296.00
Launcher, grenade, 40-mm	30	0.500/.806	85	2,550	18	765.00	6	571.06	6	571.06	1,907.12
Launcher, rocket, 3.5-in.	6	9/17.700	17	102	3	901.00			3	901.00	1,802.00
Mortar, 81-mm, on mount	120	13.250	9	1,080	80	9,540.00			40	4,770.00	14,310.00
Mortar, 4.2-in., on mount	160	26/41.0	4	640	50	8,170.00			110	17,974.00	26,144.00
Launcher, AT msle, (ENTAC)	15	37.5/82.00	3	45	4	450.00	11	2,706.00			3,156.00
Mine, apers, M16		/11.25		160			80	900.00	80	900.00	1,800.00
Mine, at M21		/22.70		48			24	544.80	24	544.80	1,089.60
Weapon, apers, M18		5.516/		198			198	1,090.98			1,090.98
AVN BN (TOE 1-75E)											
Grenade, hand, frag		1.0/2.1		150			150	345.00			345.00
Pistol, cal .45	21	.044/.057	70	1,470	21	64.68					64.68
Rifle, 7.62-mm, semiauto, lt bbl	160	0.055/.079	248	39,680	100	1,364.00	60	1,175.52			2,539.52
Gun, mach, 7.62-mm, lt wt, GP	3,080	0.063/.089	6	18,480			1,760	939.84	1,320	704.88	1,644.72
Gun, mach, 7.62-mm (kit, MG, dual, hel)	7,480	0.063/.089	10	74,800			3,740	2,356.20	3,740	3,328.60	5,684.80
Gun, mach, 7.62-mm (kit, MG quad, hel)	14,700	0.063/.089	13	191,100			7,350	6,019.65	7,350	8,503.95	14,523.60
Kit ATGM (SS-11) hel	12		3	36			6	1,134.00	6	1,134.00	2,268.00
Kit rkt 2.75-in., hel	96		3	288			48	2,592.00	48	2,592.00	5,184.00
ENGR BN (TOE 5-155E)											
Demolition kit, blasting, nonelec, w/ explo		150.000/		52				7,800.00			7,800.00
Explosives (bulk)									5,200.00		5,200.00
Grenades, hand, frag		1.0/2.1		1,000			600	1,260.00	400	840.00	2,100.00
Mine, apers, M14		/0.49		1,800					1,800	882.00	882.00
Mine, at, M15		.49.00		500					500	24,500.00	24,500.00
Mine, at, M21		/22.70		100					100	2,050.00	2,050.00
Pistol, cal .45	21	.044/.057	157	3,297	21	145.07					145.07
Rifle, 7.62-mm, semiauto	160	.055/.079	787	125,920	100	4,328.50	60	3,730.38			8,058.88
Gun, mach, 7.62-mm, lt wt, GP	3,080	0.063/.089	15	46,200			1,760	2,350.60	1,320	1,762.20	4,112.80
Gun, mach, 7.62-mm (cmbt engr veh, full-tracked) (OVM)	1,760	0.063/.089	4	7,040	1,760	626.56					626.56
105,967.28 = 52.98 tons											
32,254.32 = 16.13 tons											

5-72

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
Gun, mach, cal .30 (tk recov veh, med) (OVM)-----	2,000	.086/.098	1	2,000	2,000	196.00					196.00
Gun, mach, cal .50 (tk recov veh, med) (OVM)-----	1,680	0.390/.411	1	1,680	1,050	431.50			630	258.93	690.43
Gun, mach, Cal .50 (cmbt engr veh, full-tracked) (OVM)-----	630	0.390/.411	4	2,520	630	1,035.60					1,035.60
Launcher, grenade, 40-mm-----	24	.500/.806	89	2,670			6	430.40	18	1,291.20	1,721.60
Launcher, rocket, 3.5-in-----	6	9/17.700	65	390			3	3,445.00	3	3,445.00	6,890.00
SIGNAL BN (TOE 11-35E)											74,588.34 = 37.29 tons
Grenade, hand, frag-----		1.0/2.1		400	300	393.90			100	231.00	624.90
Pistol, cal .45-----	21	.044/.057	32	672	21	29.57					29.57
Rifle, 7.62-mm, semiauto, lt bbl-----	100	0.055/.079	543	54,300	100	2,986.50					2,986.50
Gun, mach, 7.62-mm, lt wt, GP-----	2,640	.063/.089	3	7,920			1,760	470.00	880	235.00	705.00
Gun, mach, cal .50, Bng, hv bbl-----	525	0.390/.411	10	5,250			315	1,228.50	210	863.10	2,091.60
Launcher, grenade, 40-mm-----	24	.500/.806	17	408			6	82.21	18	246.63	328.84
Launcher, rocket, 3.5-in-----	6	9/17.700	26	156			3	1,380.60	3	1,380.60	2,761.20
MP CO (TOE 19-27E)											9,527.61 = 4.76 tons
Grenade, hand, frag-----		1.0/2.1		300	200	262.60			100	231.00	493.60
Pistol, cal .45-----	31	.044/.057	169	5,239	21	156.16			10	96.38	252.48
Rifle, 7.62-mm, semiauto, lt bbl-----	160	0.055/.079	138	22,080	100	759.00	60	644.12			1,403.12
Rifle, 90-mm-----	6	9.250/15.0	9	54			3	405.00	3	405.00	810.00
Launcher, grenade, 40-mm-----	24	.500/.806	16	384	6	50.98			18	152.93	203.91
Gun, mach, 7.62-mm, lt wt, GP-----	2,640	.063/.089	9	23,760			1,760	1,404.00	880	702.00	2,106.00
											5,269.11 = 2.63 tons

HQ & HQ CO & BAND
DIV SPT COMD
(TOE 29-2E)

Grenade, hand, frag-----		1.0/2.1		50			50	115.50		115.50
Pistol, gal .45-----	21	.044/.057	9	189	21	8.32				8.32
Rifle, 7.62-mm, semiauto, lt bbl-----	100	0.055/.079	86	8,600	100	473.00				473.00
Gun, mach, 7.62-mm, lt wt, GP-----	1,760	.063/.089	2	3,520			880	156.00	880	156.00

908.82 =
0.45 tons

ADMIN CO
(TOE 12-37E)

Grenade, hand, frag-----		1.0/2.1		50			50	115.50		115.50
Pistol, cal .45-----	21	.044/.057	15	315	21	13.86				13.86
Rifle, 7.62-mm, semiauto, lt bbl-----	100	0.055/.079	317	31,700	100	1,743.50				1,743.50
Gun, mach, 7.62-mm, lt wt, GP-----	1,760	.063/.089	15	26,400			880	1,170.00	880	1,170.00

4,212.86 =
2.11 tons

MED BN
(TOE 8-35E)

Pistol, cal .45-----	21	.044/.057	23	483	21	21.25				21.25
Rifle, 7.62-mm, semiauto, lt bbl-----	100	0.055/.079	373	37,300	100	2,051.50				2,051.50

2,072.75 =
1.04 tons

SUP & TRANS BN
(TOE 29-5E)

Grenade, hand, frag-----		1.0/2.1		200			200	462.00		462.00
Pistol, cal .45-----	21	.044/.057	8	168	21	7.39				7.39
Rifle, 7.62-mm, semiauto, lt bbl-----	100	0.055/.079	416	41,600	100	2,288.00				2,288.00
Gun, mach, 7.62-mm, lt wt, GP-----	1,760	.063/.089	27	47,520			880	2,106.00	880	2,106.00
Launcher, rkt, 3.5-in-----	3	9/17.700	8	24			3	424.00		424.00

7,393.39 =
3.70 tons

MAINT BN
(TOE 29-15E)

Grenade, hand, frag-----		1.0/2.1		100			100	231.00		231.00
Pistol, cal .45-----	21	.044/.057	18	378	21	16.63				16.63
Rifle, 7.62-mm, semiauto, lt bbl-----	100	0.055/.079	673	67,300	100	3,701.50				3,701.50

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
Gun, mach, 7.62-mm, lt wt, GP-----	1,760	.063/.089	19	33,440	-----	-----	880	1,482.00	880	1,482.00	2,964.00
Launcher, rkt, 3.5-in.-----	3	9/17.700	11	33	-----	-----	3	584.10	-----	-----	584.10
Gun, mach, cal .50 (tank recov veh, med) (OVM)-----	1,680	0.390/.411	4	6,720	1,050	1,638.00	-----	-----	630	1,035.72	2,673.72
Gun, mach, cal 7.62 (tk recov veh, med) (OVM)-----	1,760	0.063/0.089	4	7,040	1,760	624.00	-----	-----	-----	-----	624.00
											10,794.95 = 5.40 tons

5-37. Ammunition Supply Data—Mechanized Division Basic Load (TOE 37E)

1	2	3	4	5	6	7	8	9	10	11	
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
HQ & HQ CO, MECH DIV (TOE 37-4E)											
Grenades, hand, frag-----		1.0/2.1		100			100	231.00			231.00
Pistol, cal .45-----	21	.044/.057	30	630	21	27.72					27.72
Rifle, 7.62-mm, semiauto, lt bbl-----	100	0.055/.079	112	11,200	100	616.00					616.00
Gun, mach, cal .50, Bng, hv bbl-----	525	0.390/.411	2	1,050			315	245.70	210	172.62	418.32
Gun, mach, cal .50 (Carr, CD)-----	1,050	0.390/.411	2	2,100	840	690.40			210	172.62	863.02
Gun, mach, cal .50, M114 (OVM)-----	1,470	0.390/.411	3	4,410	1,050	1,294.50			420	517.80	1,812.30
											3,968.36 = 1.98 tons
3 HQ & HQ CO, MECH BDE, (EA) (TOE 37-42E)											
Flares, surface, trip, M-49-----		1.500/3.18		32			16	50.90	16	50.90	100.18
Grenades, hand, frag-----		1.0/2.1		100			100	231.00			231.00
Pistol, cal .45-----	21	.044/.057	33	693	21	30.44					30.44
Rifle, 7.62-mm, semiauto, lt bbl-----	160	0.055/.079	103	16,480	100	566.50	60	488.20			1,054.70
Gun, mach, 7.62-mm (kit, MG, dual hel)-----	7,480	0.063/.089	6	44,880			3,740	1,413.72	3,740	1,997.16	3,410.88
Gun, mach, cal .50, Bng, hv bbl-----	525	0.390/.411	3	1,575			315	368.55	210	258.93	627.48
Gun, mach, cal .50 (Carr, CP)-----	1,050	0.390/.411	6	6,300	840	2,071.20			210	517.80	2,589.00
Launcher, grenade, 40-mm-----	24	0.500/.806	5	120	6	15.00	18	37.00			52.00

Launcher, rocket, 3.5-in.	6	9/17.700	6	36	3	318.00			3	318.00	636.00
Gun, mach, cal .50 M114 (OVM)	1,470	0.390/.411	3	4,410	1,050	1,294.50			420	517.80	1,812.30
Gun, mach, cal .50, rec veh lt (OVM)	1,680	0.390/.411	1	1,680	1,680	690.40					690.40
Gun, submach, cal .45	180	.044/.057	2	360	180	158.40					158.40
7 MECH INF BN (EA) (TOE 7-45E)											11,392.83 = 5.70 tons
Flares, surface, trip, M49		1.500/3.18		112			112	356.00			356.00
Grenades, hand, frag		1.0/2.1		1,500			1,500	3,150.00			3,150.00
Ignition cylinder, flamethrower		/0.375		36			36	13.50			13.50
Thickener, incd oil (2 lb)		2/		36			36	72.00			72.00
Starter, fire, NP3		0.06/		36			36	2.16			2.16
Pistol, cal .45	31	.044/.057	259	8,029	21	304.00			10	148.00	452.00
Gun, submach, cal .45	180	.044/.057	14	2,520	180	111.00					111.00
Rifle, 7.62-mm, semiauto	340	0.055/.079	586	209,240	100	3,223.00	120	5,555.28	120	5,555.28	14,333.56
Rifle, 7.62-mm, semiauto, w/bipod	740	.055/.079	56	41,440	160	492.80	380	1,680.90	200	884.80	3,058.50
Gun, mach, 7.62-mm, lt wt, GP	3,080	0.063/.089	54	166,320	1,760	8,456.00	440	2,114.00	880	4,228.00	14,788.00
Gun, mach, cal .50, Bug, hv bbl	420	0.390/.411	24	10,080	420	4,142.40					4,142.40
Gun, mach, cal .50 (mortar, 4.2-in., SP, full-tracked) (OVM)	2,100		4	8,400	1,680	2,761.60			420	690.40	3,452.00
Gun, mach, cal .50 (Carr CP)	1,050	0.390/.411	7	7,350	840	2,416.40			210	604.10	3,020.50
Gun, mach, cal .50 (carrier, pers, full- tracked) (OVM)	2,110		48	100,800	1,680	33,139.20			420	8,284.80	41,424.00
Gun, mach, cal .50 (full-tracked armored M114)	1,470		10	14,700	1,050	4,315.00			420	1,726.00	6,041.00
Gun, mach, cal .50 (tk, cmbt, 76-mm gun) (OVM)	700		2	1,470	600	468.00			100	82.00	550.00
Gun, mach, cal .50 (tk, recov veh, med) (OVM)	1,680		5	8,400	1,050	2,047.50			630	1,294.64	3,342.14
Gun, mach, cal .30 (tk, cmbt, 76-mm gun) (OVM)	5,000		2	10,000	5,000	860.00					860.00
Gun, mach, cal .30 (tk, recov veh, med) (OVM)	2,000		5	10,000	2,000	860.00					860.00
Gun, tank, 76-mm	70		2	140	60	5,100.00			10	878.00	5,978.00
Rifle, 90-mm, M67	18		18	324	6	999.00	6	1,620.00	6	1,620.00	4,239.00
Rifle, 106-mm, M40A1	40		6	240	6	1,584.00	10	3,600.00	24	8,640.00	13,824.00
Mortar, 81-mm, SP, full-tracked	155		9	1,395	115	11,800.00			40	5,400.00	17,200.00
Mortar, 4.2-in., SP, full-tracked	160		4	640	90	9,440.00			70	9,800.00	19,240.00
Launcher, grenade, 40-mm	30	0.500/.806	89	2,850	18	855.00	6	456.00	6	456.00	1,767.00
Launcher, rocket, 3.5-in.	6	9/17.700	19	114	3	513.00			3	1,009.00	1,522.00
ENTAC	15	37.5/82.00	3	45	4	450.00	11	2,706.00			3,156.00
Mine, apers, M14		/0.49		450					450	221.00	221.00
Mine, apers, M16		/11.25		52					52	585.00	585.00
Wpn, apers, M18		5.516/		198			140	952.00	58	396.00	1,348.00

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
Mine, at, M21-----	-----	/22.70	-----	680	480	23,520.00	-----	-----	200	9,800.00	33,320.00
Demo kit, blasting, nonelec-elec, w/explo-----	-----	150.00/	-----	4	-----	-----	-----	600.00	-----	-----	600.00
											203,028.76 = 101.51 tons
ENGR BN (TOE 5-145E)											
Grenades, hand, frag-----	-----	1.0/2.1	-----	1,000	-----	-----	600	1,380.00	400	920.00	2,300.00
Mine, apers, M14-----	-----	/11.25	-----	1,800	-----	-----	-----	-----	1,800	882.00	882.00
Mine, at, M15-----	-----	/49.00	-----	2,200	-----	-----	1,600	78,400.00	600	29,400.00	107,800.00
Mine, at, M21-----	-----	/22.70	-----	300	-----	-----	-----	-----	300	6,150.00	6,150.00
Pistol, cal .45-----	21	.044/.057	172	3,612	21	158.93	-----	-----	-----	-----	158.93
Rifle, 7.62-mm, semiauto-----	160	0.055/.079	783	125,280	100	4,306.50	60	3,711.42	-----	-----	8,017.92
Gun, mach, 7.62-mm, lt wt, GP-----	3,080	0.390/.411	15	46,200	1,760	2,350.60	-----	-----	1,320	1,762.20	4,112.80
Gun, mach, 7.62-mm (cmbt engr veh, full-tracked) (OVM)-----	1,760	.063/.089	8	14,080	1,760	1,253.68	-----	-----	-----	-----	1,253.68
Gun, mach, cal .30 (tk recov veh, med) (OVM)-----	2,000	.086/.098	2	4,000	2,000	392.00	-----	-----	-----	-----	392.00
Gun, mach, cal .50 (tk recov veh, med) (OVM)-----	1,680	0.390/.411	2	3,360	1,050	863.00	-----	-----	630	5.7.80	1,380.80
Gun, mach, cal .50 (cmbt engr veh, full-tracked) (OVM)-----	630	0.390/.411	8	5,040	630	2,071.20	-----	-----	-----	-----	2,071.20
Carrier Personnel FT-----	2,100	.411/	41	86,100	1,680	28,306.40	-----	-----	420	7,076.60	35,383.00
Launcher, grenade, 40-mm-----	24	0.500/.806	89	2,136	6	267.00	-----	-----	18	1,291.21	1,558.21
Launcher, rocket, 3.5-in-----	6	9/17.700	65	390	3	3,445.00	-----	-----	3	3,445.00	6,890.00
Demolition kit, blasting, nonelec, w/ explo-----	-----	/150.00	52	-----	-----	-----	-----	7,800.00	-----	-----	7,800.00
Explosives (bulk)-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5,200.00	5,200.00
											191,350.54 = 95.68 tons
SUP & TRANS BN (TOE 29-65E)											
Grenade, hand, frag-----	-----	1.0/2.1	-----	200	-----	-----	200	462.00	-----	-----	462.00
Pistol, cal .45-----	21	.044/.057	8	168	21	7.39	-----	-----	-----	-----	7.39
Rifle, 7.62-mm, semiauto, lt bbl-----	100	0.055/.079	439	43,900	100	2,414.50	-----	-----	-----	-----	2,414.50
Gun, mach, 7.62-mm, lt wt, GP-----	1,760	0.390/.411	29	41,040	-----	-----	880	2,262.00	880	2,262.00	4,524.00
Launcher, rkt, 3.5-in-----	3	9/17.700	8	24	-----	-----	3	424.00	-----	-----	424.00
											7,831.89 = 3.9 tons

MAINT BN (TOE 29-35E)										
Grenade, hand frag.....		1.0/2.1					100	231.00		231.00
Pistol, cal .45.....	21	.044/.057	20	420	21	18.48				18.48
Rifle, 7.62-mm, semiauto, lt bbl.....	100	0.055/.079	819	81,900	100	4,504.50				4,504.50
Gun, mach, 7.62-mm, lt wt, GP.....	1,760	.063/.089	17	29,920			880	1,326.00	880	2,652.00
Launcher, rkt, 3.5-in.....	3	9/17.700	13	49			3	689.00		689.00
Gun, mach, cal .50 (tank recov veh, med) (OVM).....	1,680	0.390/.411	4	6,720	1,050	1,638.00			630	2,673.72
Gun, mach, cal 7.62 (tk recov veh, med) (OVM).....	1,760	.063/.089	4	7,040	1,760	624.00				624.00
										11,392.70 = 5.69 tons

5-38. Ammunition Supply Data—Artillery Units

a. Basic Load (Nondivisional Units).

(1) Air Defense Artillery.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	Total round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
HQ & HQ BTRY, ADA BDE (TOE 44-2E)											
Gun, machine, 7.62-mm.....	530	.089	4	2,120			530	188.6			188.6
Launcher, rocket, 3.5-inch.....	6	17.7	4	24			6	424.8			424.8
Pistol, cal .45.....	21	.057	26	546	21	31.1					31.1
Rifle, 7.62-mm.....	120	.079	93	11,160	60	440.8	60	440.8			881.6
											1,526.1 = 0.76 tons
HQ & HQ BTRY ADA GP (TOE 44-12E)											
Gun, machine, 7.62-mm.....	530	.089	4	22,120			530	1,968.6			1,968.6
Launcher, rocket, 3.5-inch.....	6	17.7	4	24			6	424.8			424.8
Pistol, cal .45.....	21	.057	13	273	21	15.5					15.5
Rifle, 7.62-mm.....	120	.079	63	7,560	60	323.6	60	323.6			647.2
											3,056.1 = 1.52 tons

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
ADA MSL BN HAWK (TOE 44-235D)											
Gun, machine, 7.62-mm.....	530	.089	28	14,840			530	1,320.7			1,320.7
Launcher, zero length * GM.....			24								
Launcher, rocket, 3.5-inch.....	6	17.70	30	180			6	3,186.0			3,186.0
Pistol, cal .45.....	21	.057	16	336	21	19.2					19.2
Rifle, 7.62-mm.....	120	.079	656	78,720	60	3,109.4	60	3,109.4			6,218.8
											10,744.7 = 5.37 tons
ADA MSL BN NIKE-HERCULES (TOE 44-535D)											
Gun, machine, 7.62-mm.....	530	.089	33	17,490			530	1,556.6			1,556.6
Launcher, rocket, 3-5 inch.....	6	17.70	19	114					114	2,230.2	2,230.2
Launcher, loader * GM/NIKE-HERC.....			36								
Pistol, cal .45.....	21	.057	13	273	21	15.5					15.5
Rifle, 7.62-mm.....	120	.079	768	92,160	60	3,640.3	60	3,640.3			7,280.6
											11,082.9 = 5.54 tons
ADA AW BN SP (TOE 44-85F)											
Gun, machine, cal .50.....	530	0.390	13	6,890			530	2,685.5			2,685.5
Launcher, rocket, 3-5-inch.....	6	17.70	20	120			6	2,124.0			2,124.0
Pistol, cal .45.....	21	0.057	17	357	21	20.3					20.3
Rifle, 7.62-mm.....	120	0.079	683	81,960	60	3,237.4	60	3,237.4			6,474.8
Machine, gun, cal .30 OVM revy veh.....	2,000	0.086	1	2,000			2,000	172			172.0
Gun, machine, cal .50 OVM revy veh.....	1,680	0.390	1	1,680			1,680	655.2			655.2
Gun, twin, 44-mm sp.....	720	6.60	64	46,030			480	203,752.0	240	101,376	304,128.0
Gun, machine, cal .30 OVM gun 40-mm.....	2,000	.086	64	128,000			2,000	11,008.0			11,008.0
											327,367.8 = 163.6 tons

* For classified data pertaining to this unit, see FM 101-10-3.

(2) Field Artillery.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
HQ & HQ BTRY CORPS ARTY OR ABN CORPS ARTY (TOE 6-501E)											
Gun, mach, 7.62-mm, lt wt, GP.....	1,760	¹ 0.63 ² 0.089	2	3,520			880	¹ 110.88	880	² 156.64	267.52
Launcher, rkt, 3.5-in.....	6	¹ 9.0 ² 17.7	3	18			3	¹ 81.00	3	² 159.30	240.30
Launcher, grenade, 40-mm.....	26	¹ 5.00 ² 8.06	1	26			8	¹ 4.00	18	² 14.51	18.51
Pistol, semiauto, cal .45.....	21	¹ 0.44 ² 0.057	18	378	21	¹ 16.63					16.63
Rifle, semiauto, 7.62-mm.....	160	¹ 0.55 ² 0.079	180	28,800	100	990.00	60	² 853.20			1,843.20
											2,385.86 = 1.19 tons
HQ & HQ BTRY FA GP (TOE 6-401E)											
Gun mach 7.62-mm, lt wt, GP.....	1,760	¹ 0.63 ² 0.089	4	7,040			880	¹ 221.76	880	² 313.28	535.04
Launcher, rkt, 3.5-in.....	6	¹ 9.0 ² 17.7	2	12			3	¹ 54.00	3	² 106.20	160.20
Launcher, grenade, 40-mm.....	26	¹ 5.00 ² 8.06	6	156			8	¹ 24.00	18	² 87.05	111.05
Pistol, semiauto, cal .45.....	21	¹ 0.44 ² 0.057	18	378	21	¹ 16.63					16.63
Rifle, semiauto, 7.62-mm, lt bbl.....	160	¹ 0.55 ² 0.079	86	13,760	100	¹ 473.00	60	² 455.04			928.04
											1,750.96 = .88 tons
FA HOW BN 105-MM TOWED ³ (TOE 6-405E)											
Gun, mach, 7.62-mm, lt wt, GP.....	1,760	¹ 0.63 ² 0.089	52	91,520			880	2,882.88	880	4,072.64	6,955.52
Howitzer 105-mm towed.....	200	60.0	18	3,600			60	60,800.0	140	151,200.00	212,000.00

See footnotes at end of table.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
*115-mm Multiple rocket launcher, M91-----	90	15 rds 1400 lbs	9	810							
Launcher, rkt, 3.5-in.-----	6	¹ 9.0 ² 17.7	27	162			3	¹ 729.00	3	² 1,433.70	2,162.70
Pistol, semiauto, 7.62-mm-----	21	¹ .044 ² .057	53	1,113	21	¹ 48.93					48.93
Rifle, semiauto, 7.62-mm, lt bbl-----	160	¹ .055 ² .079	413	66,080	100	¹ 2,271.50	60	² 1,957.62			4,229.12
Launcher, grenade, 40-mm-----	26	¹ .500 ² .806	43	1,118			8	¹ 172.00	18	² 623.84	625.84
											226,022.11 = 113.01 tons
FA BN, 155-MM, SP (TOE 6-365E)											
Gun, mach, 7.62-mm-----	1,760	0.080	28	49,280			24,400	1,952.00	24,880	1,971.20	3,923.20
Launcher, rocket 3.5-inch-----	6	17.700	33	198	6	3,504.60					3,504.60
Launcher, grenade, 40-mm-----	26	0.806	25	650	5	100.75			21	423.15	523.90
Pistol, automatic cal .45-----	21	0.057	50	1,050	21	59.85					59.85
Rifle, semiauto, 7.62-mm-----	160	0.079	525	84,000	100	4,147.50			60	2,488.50	6,636.00
Howitzer, 155-mm-----	275	112.000	18	4,950			**114	229,824	***161	324,576	554,400.00
											569,047.55 = 284.53 tons
Howitzer, 155-mm (reduced strength)---	(150)	(112.000)	(18)	(2,700)			(**114)	(229,824)	(***36)	(72,576)	(302,400.00)
											(317,047.55) = 158.53 tons
FA HOW BN 155-MM TOWED (TOE 6-425E)											
Gun, mach, 7.62-mm, lt weight, GP-----	1,760	¹ .063 ² .089	56	98,560			880	¹ 3,104.64	880	² 4,385.92	7,490.56
Howitzer, 155-mm, towed-----	150	¹ 129.3 ² 133.2	18	2,700			28	65,167.2	122	292,507.00	357,674.40
Launcher, rkt, 3.5-in.-----	6	¹ 9.0 ² 17.7	18	108			6	¹ 972.00			972.00
Launcher, grenade, 40-mm-----	26	¹ .500 ² .806	40	1,040			8	¹ 160.00	18	² 580.32	740.32
Pistol, semiauto, cal .45-----	21	¹ .044 ² .057	54	1,134	21	¹ 49.90					49.90

Rifle, semiauto, 7.62-mm, lt bbl.....	160	¹ .055 ² .079	471	75,360	100	¹ 2,590.50	60	² 2,232.54			4,823.04
FA HOW BN 155-MM SP ³ (TOE 6-455E)											371,750.22 = 185.87 tons
Gun, mach, 7.62-mm, lt weight, GP.....	1,760	¹ .063 ² .089	53	93,280			880	¹ 2,938.32	880	² 450.96	7,089.28
Howitzer, 155-mm, SP.....	150	¹ 129.3 ² 133.2	18	2,700			28	65,167.2	122	292,507.00	357,674.40
Launcher, rkt, 3.5-in.....	10	¹ 9.0 ² 17.7	18	180			5	¹ 810.00	5	² 1,593.00	2,403.00
Launcher, grenade, 40-mm.....	26	¹ .500 ² .806	37	962			8	¹ 148.00	18	² 536.79	684.79
Pistol, semiauto, cal .45.....	21	¹ .044 ² .057	49	1,029	21	¹ 45.28					45.28
Rifle, semiauto, 7.62-mm, lt bbl.....	160	¹ .055 ² .079	481	76,960	100	¹ 2,645.50	60	² 2,279.94			4,925.44
FA HOW BN 8-IN., TOWED ⁴ (TOE 6-415E)											372,825.19 = 186.41 tons
Gun, mach, 7.62-mm, lt weight, GP.....	1,760	¹ .063 ² .089	37	65,120			880	¹ 2,051.28	880	² 2,897.84	4,949.12
Howitzer 8-in., towed.....	100	¹ 256.0 ² 266.0	12	1,200			20	59,440.2	80	255,360.2	314,800.00
Launcher, rkt 3.5-in.....	10	¹ 9.0	31	310			5	¹ 1,395.00	5	² 2,743.50	4,138.50
Pistol, semiauto, cal .45.....	21	¹ .044	53	1,113	21	¹ 48.97					48.97
Rifle, semiauto, 7.62-mm lt bbl.....	160	¹ .055 ² .079	498	79,680	100	¹ 2,739.00	60	² 2,360.52			5,099.52
Launcher, grenade 40-mm.....	26	¹ .500 ² .806	29	754			8	¹ 116.00	18	² 420.73	536.73
FA HOW BN, 8-IN., SP ⁴ (TOE 6-445E)											320,572.84 = 164.79 tons
Gun, mach 7.62-mm, lt wt GP.....	1,760	¹ .063 ² .089	34	59,840			880	¹ 1,884.96	880	² 2,662.88	4,547.84
Howitzer, 8-in., SP.....	100	¹ 256.0 ² 266.0	12	1,200			2	¹ 6,144.0	98	312,816.2	318,960.00

* See footnote 17 at end of table.

** Includes 26 rounds on Howitzer Carriage and 88 rounds on M548.

*** Includes rounds carried on Truck Cargo 5-ton and trailers 1½-2-ton ammunition.

See footnotes at end of table.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
Launcher, rkt, 3.5-in.-----	10	¹ 9.0 ² 17.7	31	310			5	1,395.00	5	² 2,743.50	4,138.50
Pistol, semiauto, cal .45-----	21	¹ 0.044 ² 0.057	55	1,155	21	50.82					50.82
Rifle, semiauto 7.62-mm, lt bbl-----	160	¹ 0.055 ² 0.079	496	79,360	100	¹ 2,728.00	60	² 2,351.04			5,079.04
Launcher, grenade 40-mm-----	26	¹ 5.00 ² 8.06	29	754			8	¹ 116.00	18	² 420.73	536.73
FA GUN BN, 175-MM, SP (TOE 6-435D)											333,312.93 = 166.65 tons
Gun, mach 7.62-mm, lt wt GP-----	1,760	¹ 0.063 ² 0.089	51	89,760			880	¹ 2,287.44	880	² 3,994.32	6,821.76
Gun, FA, 175-mm, SP-----	114	¹ 265.0 ² 275.0	12	1,368			2	6,360.0	1,344	369,600	375,960.00
Launcher, rkt 3.5-in.-----	10	¹ 9.0 ² 17.7	26	260			5	¹ 1,170.00	5	² 2,301.00	3,471.00
Launcher, grenade 40-mm-----	26	¹ 5.00 ² 8.06	47	1,222			8	¹ 188.00	18	681.88	869.88
Pistol, semiauto, cal .45-----	21	¹ 0.044 ² 0.057	74	1,554	21	68.38					68.38
Rifle, semiauto 7.62-mm lt bbl-----	160	¹ 0.055 ² 0.079	465	74,400	100	¹ 2,557.50	60	² 2,204.10			4,761.60
FA GUN BN, 280-MM ⁵ (TOE 6-535D)											381,952.62 = 190.98 tons
Gun, mach, 7.62-mm lt wt GP-----	1,760	¹ 0.063 ² 0.089	17	29,920			880	¹ 942.48	880	² 1,331.44	2,273.92
Gun, 280-mm on carriage-----			6								
Launcher, rkt, 3.5-in.-----	6	¹ 9.0 ² 17.7	20	120			3	¹ 540.00	3	² 1,062.00	1,602.00
Pistol, semiauto cal .45-----	21	¹ 0.044 ² 0.057	21	441	21	¹ 19.40					19.40
Rifle, semiauto, 7.62-mm, lt bbl-----	160	¹ 0.055 ² 0.079	440	70,400	100	¹ 2,420.00	60	² 2,085.60			4,505.60
											¹⁰ 8,420.32 = 4.21 tons

FA BN HONEST JOHN ⁶
RKT SP
(TOE 6-525E)

Gun, mach, 7.62-mm lt wt GP	1,760	¹ 0.063 ² 0.089	28	49,280			880	¹ 1,552.32	880	² 2,192.96	3,745.28
Launcher, 762-mm rkt trk mtd											
Launcher, rkt 3.5-in	6	¹ 9.0 ² 17.7	22	132			3	¹ 594.00	3	² 1,168.20	1,762.20
Pistol, semiauto cal .45	21	¹ 0.044 ² 0.057	81	1,701	1,701	¹ 84.84					84.84
Rifle, semiauto, 7.62-mm lt bbl	160	¹ 0.055 ² 0.079	286	45,760	100	¹ 1,573.00	60	² 1,355.64			2,928.64
Launcher, grenade 40-mm	26	¹ 5.00 ² 8.06	47	1,222			8	¹ 188.00	18	² 681.88	869.88
¹¹ 9,390.84 = 4.70 tons											

FA BN LITTLE JOHN ⁷
(TOE 6-565T)

Gun, mach 7.62-mm lt wt GP	1,760	¹ 0.063 ² 0.089	20	35,200			880	¹ 1,108.80	880	² 1,566.40	2,675.20
Launcher, rkt, 318-mm			4								
Launcher, rkt, 3.5-in	6	¹ 9.0 ² 17.7	18	108			3	¹ 483.00	3	² 955.80	1,441.80
Pistol, semiauto, cal .45	21	¹ 0.044 ² 0.057	11	231	21	¹ 10.16					10.16
Rifle, semiauto, 7.62-mm	160	¹ 0.055 ² 0.079	202	32,320	100	¹ 1,111.00	60	² 957.48			2,068.48
¹² 6,195.64 = 3.10 tons											

FA BN CORPORAL
(TOE 6-545E)

Gun, mach 7.62-mm, lt wt GP	1,760	¹ 0.063 ² 0.089	11	19,360			880	¹ 609.84	880	² 861.52	1,471.36
Launcher, GM/CPL 11			3								
Launcher, rkt 3.5-in	6	¹ 9.0 ² 17.7	13	78			3	¹ 351.00	3	² 690.30	1,041.30
Pistol, semiauto, cal .45	21	¹ 0.044 ² 0.057	9	189	21	¹ 8.31					8.31
Rifle, semiauto, 7.62-mm, lt bbl	160	¹ 0.055 ² 0.079	252	40,320	100	¹ 1,386.00	60	² 1,194.48			2,580.48
¹⁴ 5,101.45 = 2.55 tons											

See footnotes at end of table.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpu	Total weight (lb)	Round per wpu	Total weight (lb)	
FA BN REDSTONE (TOE 6-635E)											
Gun, mach, 7.62-mm, lt wt GP-----	1,760	¹ 0.63 ² 0.089	42	73,920			880	¹ 2,328.48	880	² 3,289.34	5,617.82
Launcher, GM XM 30-----			2								
Launcher, rkt, 3.5-in.-----	6	¹ 9.0 ² 17.7	23	138			3	¹ 621.00	3	² 1,221.30	1,842.30
Pistol, semiauto, cal .45-----	21	¹ 0.44 ² 0.057	21	441		¹ 19.40					19.40
Rifle, semiauto, 7.62-mm, lt bbl-----	160	¹ 0.055 ² 0.079	609	97,440	100	¹ 3,349.50	60	² 2,886.66			6,236.16
											¹⁵ 13,715.68 = 6.86 tons
FA BN SERGEANT ⁹ (TOE 6-555T)											
Launching station GM XM 504-----			2								
Launcher, rkt, 3.5-in.-----	6	¹ 9.0 ² 17.7	15	90			3	¹ 405.00	3	² 769.50	1,201.50
Gun, mach, 7.62-mm, lt wt GP-----	1,760	¹ 0.63 ² 0.089	15	26,400			880	¹ 831.00	880	² 1,174.80	2,005.80
Pistol, semiauto, cal .45-----	21	¹ 0.44 ² 0.057	15	315	21	13.86					13.86
Rifle, semiauto, 7.62-mm, lt bbl-----	160	¹ 0.055 ² 0.079	312	37,440	100	¹ 1,716.00	60	² 1,478.88			3,194.88
											¹⁶ 6,416.04 = 3.21 tons
FA BN PERSHING ⁸ (TOE 6-615T)											
Erector, launcher GM XM3-----			4								
Gun, mach, 7.62-mm, lt wt GP-----	1,760	¹ 0.63 ² 0.089	29	51,040			880	¹ 1,607.76	880	² 2,271.28	3,879.04
Launcher, grenade, 40-mm-----	26	¹ 5.00 ² 8.06	55	1,430			8	¹ 220.00	18	² 797.94	1,017.94
Launcher, rocket, 3.5-in.-----	6	¹ 9.0 ² 17.7	28	168			3	¹ 756.00	3	² 1,486.80	2,242.80
Pistol, semiauto, cal .45-----	21	¹ 0.44 ² 0.057	103	2,163	21	¹ 95.17					95.17

Rifle, semiauto, 7.62-mm, lt bbl-----	160	1.055 2.079	535	85,600	100	¹ 2,942.50	60	² 2,535.90			5,478.40
FA TARGET ACQUISITION BN (TOE 6-575E)											¹⁷ 12,713.35 = 6.36 tons
Gun, mach, 7.62-mm, lt wt, GP-----	1,760	1.063 2.089	57	100,320			880	¹ 3,160.08	880	² 4,464.24	7,624.32
Launcher, rkt, 3.5-in.-----	6	¹ 9.0 ² 17.7	47	282			3	¹ 1,269.00	3	² 2,495.70	3,764.70
Pistol, semiauto, cal .45-----	21	1.044 2.057	41	861	21	¹ 37.88					37.88
Rifle, semiauto, 7.62-mm, lt bbl-----	160	1.055 2.079	709	113,440	100	¹ 3,899.50	60	² 3,360.66			7,260.16
Launcher, grenade, 40-mm-----	26	1.500 2.806	37	962			8	148.00	18	² 536.80	684.80
FA SLT BTRY (TOE 6-558E)											19,371.86 = 9.69 tons
Gun, mach 7.62-mm lt wt, GP-----	1,760	1.063 2.089	24	42,240			880	¹ 1,330.56	880	² 1,879.68	3,210.24
Launcher, rkt, 3.5-in.-----	6	¹ 9.0 ² 17.7	4	24			3	¹ 108.00	3	212.40	320.40
Pistol, semiauto, cal .45-----	21	1.044 2.057	15	315	21	¹ 13.86					13.86
Rifle, semiauto, 7.62-mm, lt bbl-----	160	1.055 2.079	136	21,760	100	¹ 748.00	60	² 664.64			1,412.64
Launcher, grenade, 40-mm-----	26	1.500 2.806	8	208			8	32.00	18	116.06	148.06
											4,957.14 = 2.48 tons

- ¹ Wt per round (lb) w/o container.
² Wt per round (lb) packaged.
³ Includes Medical Detachment.
⁴ See FM 101-10-3, paragraph 1-8.
⁵ See FM 101-10-3, paragraph 1-7.
⁶ See FM 101-10-3, paragraph 1-3.
⁷ See FM 101-10-3, paragraph 1-6.
⁸ See FM 101-10-3, paragraph 1-11.
⁹ See FM 101-10-3, paragraph 1-10.

- ¹⁰ Does not include line 55.
¹¹ Does not include line 60.
¹² Does not include line 66.
¹³ Not used.
¹⁴ Does not include line 76.
¹⁵ Does not include line 80.
¹⁶ Does not include line 85.
¹⁷ WABTOC ITEM. Not included in total weight. Additional transportation necessary to carry recommended basic load.

b. Basic Load Division—Artillery Units.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
HQ & 4Q BTRY, DIVISION ARTILLERY AIRBORNE (TOE 6-201E)											
Gun, mach, 7.62-mm, lt wt, GP-----	1,760	1.063 2.089	9	15,850			880	1 498.96	880	2 704.88	1,203.84
Launcher, rkt, 3.5-inch-----	6	19.0 2 17.7	7	42			3	1 189.00	3	2 371.70	560.70
Launcher, grenade, 40-mm-----	26	1.500 2.806	6	156			8	1 24.00	18	2 87.05	111.05
Pistol, semiauto, cal .45-----	21	1.044 2.057	33	693	21	1 30.49					30.49
Rifle, semiauto, 7.62-mm-----	160	1.055 2.079	154	24,640	100	847.00	60	729.96			1,576.96
											3,483.06 = 1.74 tons
FA HOW BN 105-MM TOWED (TOE 6-215E)											
Gun, mach, 7.62-mm, lt wt, GP-----	2,640	1.063 2.089	18	47,520	220	1 249.48	880	2 1,409.76	1,540	2 2,467.08	4,126.32
Launcher, rkt, 3.5-inch-----	10	19.0 2 17.7	23	230			10	1 2,070.00			2,070.00
Launcher, grenade, 40-mm-----	26	1.500 2.806	24	624	8	1 96.00	18	2 348.19			444.19
Pistol, semiauto, cal .45-----	21	1.044 2.057	44	924	21	1 40.66					40.60
Rifle, semiauto, 7.62-mm-----	160	1.055 2.079	406	64,960	60	1 1,339.80			100	2 3,207.40	4,547.20
Howitzer, 105-mm-----	190	65.00	18	3,420			40	46,800.00	150	175,500.00	222,300.00
115-mm Multiple rkt, lchr, M91 ³ -----	90	15 rds 1,400 lbs	3								
											233,528.37 = 116.76 tons
FA BTRY LITTLE JOHN (TOE 6-228E)											
Gun, mach, 7.62-mm, lt wt, GP-----	2,640	1.063 2.089	9	23,760	220	1 124.74	880	2 704.88	1,540	2 1,233.54	2,063.16

Launcher, rkt, 3.5-inch	10	¹ 9.0 ² 17.7	9	90			10	810.00		810.00
Launcher, grenade, 40-mm	26	¹ 5.00 ² 8.06	11	286	8	44.00	18	159.59		203.59
Pistol, semiauto, cal .45	21	¹ 0.44 ² 0.57	12	252	21	11.09				11.09
Rifle, semiauto, 7.62-mm	160	¹ 0.55 ² 0.79	111	17,760	60	¹ 366.30			100	² 876.90 1,243.20
Launcher, rkt, 318-mm	(4)		2							
HQ & HQ BTRY DIVISION ARTILLERY (INF) (MECH) (ARMORED) (TOE 6-302E)										4,331.04 = 2.17 tons
Gun, mach, 7.62-mm, lt wt, GP	1,760	¹ 0.63 ² 0.89	10	17,600			880	¹ 554.50	880	² 783.20 1,337.60
Launcher, rkt, 3.5-inch	6	¹ 9.0 ² 17.7	7	42			3	¹ 189.00	3	² 371.70 560.70
Launcher, grenade, 40-mm	26	¹ 5.00 ² 8.06	4	104			8	¹ 16.00	18	² 59.64 75.64
Pistol, semiauto, cal .45	21	¹ 0.44 ² 0.57	34	714	21	¹ 31.42				31.42
Rifle, semiauto, 7.62-mm	160	¹ 0.55 ² 0.79	169	27,040	100	¹ 929.50	60	² 801.06		1,730.56
FA HOW BN 105-MM TOWED (TOE 6-155E) (INF)										3,735.92 = 1.87 tons
Gun, mach, 7.62-mm, lt wt, GP	1,760	¹ 0.63 ² 0.89	32	56,320			880	¹ 1,774.08	880	² 2,506.24 4,280.32
Launcher, rkt, 3.5-inch	6	¹ 9.0 ² 17.7	29	174			3	¹ 783.00	3	² 1,739.90 2,522.90
Launcher, grenade, 40-mm	26	¹ 5.00 ² 8.06	21	546			8	¹ 84.00	18	² 304.67 388.67
Pistol, semiauto cal .45	21	¹ 0.44 ² 0.57	41	861	21	¹ 37.88				37.88
Rifle, semiauto, 7.62-mm	160	¹ 0.55 ² 0.79	449	71,840	100	¹ 2,469.50	60	² 2,128.26		4,597.76
Howitzer, 105-mm on-carriage	200	65.00	18	3,600			60	70,200.00	140	163,000.00 234,000.00
115-mm Multiple rkt Lehr, M91 ³	90	15 rds 1,400 lbs								
										245,827.53 = 122.96 tons

See footnotes at end of table.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
3 FA BN 155-MM SP (TOE 6-365E)											
Gun, mach, cal .50 (OEM, 155-mm How)	600	.390/.411	18	10,800			500	3,510.00	100	739.80	4,249.80
Gun, mach, cal .50 (OEM recovery vehicle, tracked)	600	.390/.411	2	1,200			500	390.00	100	82.20	472.20
Gun, Mach, 7.62-mm, lt wt	1,760	.063/.089	32	66,320			380	1,774.08	880	2,506.24	4,280.32
Howitzer, 155-mm, SP, M109	275	129.3/133.2	18	2,700			28	65,167.20	247	592,207.20	657,374.40
Launcher, Grenade, 40-mm	26	.500/.806	35	910			8	140.00	18	315.00	455.00
Launcher, Rkt, Multiple, 115-mm	90	93.33	3	270					(270)		Do not include in total. ³
Launcher, Rkt, 3.5-inch	6	9/17.7	20	120			3	540.00	3	1,062.00	2,602.00
Pistol, Auto, cal .45	21	.044/.057	68	1,428	21	62.83					62.83
Rifle, Semiauto, 7.62-mm, lt bbl	160	.055/.079	475	76,000	100	2,612.50	60	2,251.50			4,864.00
											173,360.55 = 86.68 tons
FA BN, 155-MM, 8-INCH, TOWED (TOE 6-165E) (INF)											
Gun, mach, 7.62-mm, lt wt, GP	1,760	1.063 2.089	41	72,160			880	1 2,273.04	880	2 3,211.12	5,484.16
Launcher, rkt, 3.5-inch	6	1 9.0 2 17.7	33	198			3	1 891.00	3	2 1,752.30	2,643.30
Launcher, grenade, 40-mm	26	1.500 2.806	25	650			8	1 100.00	18	2 362.70	462.70
Pistol, semiauto, cal .45	21	1.044 2.057	46	966	21	1 42.50					42.50
Rifle, semiauto 7.62-mm	160	1.055 2.079	559	89,440	100	1 3,074.50	60	2 2,649.66			5,724.16
Howitzer, 155-mm, towed	150	1 129.3 2 133.2	18	2,700			28	65,167.2	122	292,507.	357,674.40
Howitzer, 8-inch, towed	100	1 256.0 2 266.0	4	400			20	20,840.0	80	2 85,120.	105,960.00
											478,991.22 = 239.49 tons
FA BN 155-MM, 8-INCH, SP (MECH) (ARMORED) (TOE 6-355E)											
Gun, mach, 7.62-mm, lt wt, GP	1,760	1.063 2.089	23	40,480			880	1 1,275.12	880	2 1,801.36	3,076.48

Launcher, rkt, 3.5-inch.....	6	¹ 9.0 ² 17.7	33	198			3	¹ 891.00	3	² 1,752.30	2,643.30
Launcher, grenade, 40-mm.....	26	¹ 5.00 ² 8.06	25	650			8	¹ 100.00	18	² 362.70	462.70
Pistol, semiauto, cal .45.....	21	¹ .044 ² .057	50	1,050	21	¹ 46.20					46.20
Rifle, semiauto, 7.62-mm.....	160	¹ .055 ² .079	546	87,360	100	¹ 3,003.00	60	² 2,588.04			5,591.04
Howitzer, 155-mm, SP, M109.....	150	¹ 129.3 ² 133.2	18	2,700			28	65,167.2	122	292,507.	357,674.40
Howitzer, 8-inch.....	100	¹ 256.0 ² 266.0	4	400			2	1,648.0	98	104,272.	105,920.00
											475,414.12 = 237.72 tons
FA BN HONEST JOHN (INF) (MECH) (ARMORED) (TOE 6-175E)											
Gun, mach, 7.62-mm, lt wt, GP.....	1,760	¹ .063 ² .089	19	33,440			880	¹ 1,053.36	880	² 1,448.08	2,541.44
Launcher, rkt, 3.5-inch.....	6	¹ 9.0 ² 17.7	20	120			3	¹ 540.00	3	² 1,062.00	1,602.00
Launcher, grenade, 40-mm.....	26	¹ 5.00 ² 8.06	13	338			8	¹ 52.00	18	² 188.60	240.60
Pistol, semiauto, cal .45.....	21	¹ .044 ² .057	27	567	21	¹ 24.95					24.95
Rifle, semiauto, 7.62-mm.....	160	¹ .055 ² .079	218	34,880	100	1,199.00	60	1,033.32			2,232.32
Launcher, 7.62-mm rkt.....	(4)		4								
											6,641.31 = 3.32 tons

¹ Weight per round (lb) w/o containers.

² Weight per round (lb) packaged.

³ WABTOC item. Not included in total weight. Additional transportation necessary to carry basic load.

⁴ See FM 101-10-3, chapter 5.

c. *Resupply Capacity, Organic Ammunition Vehicles* (Prime movers of weapons and weapon carriers not included).

	1	2	3	4	5	6	7	8
1	Unit	Truck, 2½-ton, and trailer, 1½-ton	Truck, 2½-ton, and trailer, M10A1 ¹	Truck, cargo, 5-ton	Truck, cargo, 5-ton, and trailer, 1½-ton	Truck, cargo, 5-ton, and trailer, M10A1 ¹	Tractor, M5A4, ² and trailer, M10A1 ¹	Capacity (tons)
2	FA bn, 105-mm, towed.....		21					81.27
3	FA bn, 105-mm, SP.....		21					81.27
4	FA bn, 155-mm, towed.....		12			9	3	112.02
5	FA bn, 155-mm, SP.....		12			18		161.10
6	FA bn, 8-in., towed.....			2	18			136.00
7	FA bn, 8-in., SP.....			2	18			136.00
8	FA bn, 280-mm.....	(³)		16				120.00
9	FA bn, 175-mm.....			3	18			141.00

¹ Trailer, M10A1, carries 1.37 tons ammunition (56 rounds 105-mm, 23 rounds 155-mm).

² Tractor, M5, carries 24 rounds 155-mm ammunition (1.38 tons), 58 rounds 105-mm (1.38 tons).

³ 4 trucks, 20 trailers.

5-39. Ammunition Supply Data—Armor Units (Nondivisional) Basic Load

a. Ammunition Supply Data—Armor Units (Nondivisional).

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
HQ & HQ CO SEPARATE ARMORED BRIGADE (TOE 17-102E)											
Flares, surface, trip, M49		1.5/3.18		96			96	144.00			144.00
Grenade, hand, colored smoke, M18		1.25/		32			32	40.00			40.00
Grenade, hand, frag		1.00/2.10		160			160	160.00			160.00
Grenade, hand, incd, AN-M14		2.00/		123			123	246.00			246.00
Grenade, hand, smoke, HC		1.50/		8			8	12.00			12.00
Gun, machine, cal .50 Brg HB Flex	500	.390/.411	4	2,000			500	780.00			780.00
Gun, machine, cal .50 (OEM comd and Rcn carrier, M114)	1,400	.390/.411	3	4,200			1,000	1,170.00	400	493.20	1,663.20
Gun, machine, 7.62-mm lt wt GP	3,080	.063/.089	2	6,160			2,200	277.20	880	156.64	433.84
Gun, machine, 7.62-mm (OEM comd and Rcn carrier, M114)	3,520	.063/.089	3	10,560			2,640	498.96	880	234.96	733.92
Launcher, grenade, 40-mm	30	.500/.806	8	240	18	72.00	6	38.69	6	38.69	149.38
Launcher, rocket, 3.5-inch	9	9/17.7	5	45			6	531.00	3	265.50	796.50
Pistol, automatic, cal .45	21	.044/.057	47	987	21	43.43					43.43
Revolver, cal .38	18		1	18		neg 1					neg 1
Rifle, 90-mm	18	9.25/15.00	1	18	6	55.50	6	90.00	6	90.00	235.50
Rifle, semiauto, 7.62-mm lt bbl	340	.55/.079	176	59,840	100	968.00	120	1,668.48	120	1,668.48	4,304.96
Starter, fire, NP 3		.06/		8			8	.48			.48
											9,743.21 = 4.87 tons
Tank bn, sep armd bde	Same as Tk Bn, Armd Div										
Armd Cav Trp, Sep Armd Bde	Same as Armd Cav Trp, Armd Cav Sqdn, Armd Div										

b. Weight of Basic Load of Ammunition for Armored Units (Nondivisional). (Based on type combat vehicles.)

	1	2	3	4	5
1	Unit	TOE	Wt of basic load for TOE weapons, mines, and demolitions (tons)	Wt of basic load for on-vehicle armament (tons)	Total wt of unit basic load (tons)
2	HQ & HQ co, sep armd bde.....	17-102E	3.68	1.19	4.87
3	Armd cav regt.....	17-51D	94.80	571.30	666.10
4	HQ & HQ trp.....	17-52D	(2.08)	(5.41)	(7.49)
5	3 Armd cav sq.....	17-55D	(90.51)	(565.89)	(656.40)
6	Avn co.....	1.67D	(2.21)	(0.00)	(2.21)

5-40. Ammunition Supply Data—Chemical Units—Basic Load

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	TOTAL round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
HQ & HQ DET CML SMOKE GENR BN (TOE 3-266E)											
Pistol, auto, cal .45.....	21	0.057	2	42	21	2.39					2.39
Rifle, semiauto, 7.62-mm, lt bbl.....	160	0.072	20	3,200	60	86.40	100	144.00			230.40
											232.79 = 0.12 tons
CML SMOKE GENR CO (TOE 3-267E)											
Gun, mach, cal .50, Brg, hv bbl, flex....	530	0.390	3	1,590			530	620.10			620.10
Gun, mach, 7.62-mm, lt wt, general purpose.....	2,200	0.080	5	11,000			2,200	880.00			880.00
Launcher, rocket, 3.5-in.....	6	17,700	4	24			6	424.80			424.80
Pistol, auto, cal .45.....	21	0.057	1	21	21	1.20					1.20
Rifle, semiauto, 7.62-mm, lt bbl.....	160	0.072	141	22,560	60	609.12	100	1,015.20			1,624.32
Smoke pot, HC, 30-lb, M5.....		33.000		196				3,168.00			2,168.00
Generator, smoke, mechanical, pulse-jet ²											
Fog oil.....	³ 3	461.000	48	144			3	66,384.00			66,384.00
Gasoline.....	⁴ 2	42.000	48	96			2	4,032.00			4,032.00
											77,214.42 = 38.57 tons

¹ Round is M5 smoke pot; basis is 2 smoke pots per mechanical smoke generator.

² One smoke generator operating at normal rate consumes approximately 960 gallons of fog oil and 72 gallons of gasoline per 24-hour day.

³ Round is 55-gal drum of fog oil (SGF2).

⁴ Round is 5-gal can of gasoline.

5-41. Ammunition Supply Data—Engineer Units (Nondivisional)—Basic Load

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Rd per Weapon	Wt per rd (lb) unboxed/ boxed	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
					Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
ENGR CMBT BN, ARMY (TOE 5-35E)											
2 gun, mach, 7.62-mm lt weight, GP-----	3,080	.063/.089	17	52,360	880	942.48	1,320	1,997.16	880	1,331.44	4,271.08
Launcher, rkt, 3.5 in.-----	12	9.0/17.70	53	636	3	1,431.0	3	2,814.3	6	5,628.6	9,873.9
Pistol, semiauto, cal .45-----	21	.044/.057	125	2,625	21	115.5					115.5
Rifle, semiauto, 7.62-mm, lt barrel-----	340	.055/.079	697	236,980	100	3,833.5	120	6,607.56	120	6,607.56	17,048.62
Launcher, grenade, 40-mm-----	30	.50/.806	78	2,340	18	702.0	6	377.2	6	377.2	1,456.4
											32,765.50 = 16.38 tons

5-42. Ammunition Supply Data—Signal Units (Nondivisional)—Basic Load

1	2	3	4	5	6	7	8	9	10	11	12	13
Unit and type munition	Rd per wpn	Wt per rd (lb)	Wt per rd (lb) packaged	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
CORPS SIG BN (TOE 11-15E)												
Gun, mach, cal .50, hv bbl-----	525	0.390	0.411	3	1,575			315	368.550	210	258.930	627.480
Launcher, grenade, 40-mm-----	26	0.500	0.806	38	988			8	152.000	18	551.304	703.304
Launcher, rocket, 3.5-in.-----	6	9.000	17.700	4	24			3	108.000	3	212.400	320.400
Pistol, cal .45-----	21	0.044	0.057	62	1,302	21	57.288					57.288
Rifle, 7.62-mm, semiauto, lt bbl-----	300	0.055	0.079	721	216,300	100	3,965.500	100	5,695.900	100	5,695.900	15,357.300
												17,065.772 = 8.5329 short tons
HQ & HQ DET, SIG GP (TOE 11-22E) ¹												
Gun, mach, cal .50, hv bbl-----	525	0.390	0.411	1	525			315	122.850	210	86.310	209.160

AGO 6169A	Launcher, rocket, 3.5-in.---	6	9.000	17.700	1	6		3	27.000	3	53.100	80.100
	Pistol, cal .45-----	21	0.044	0.057	5	105	21	4.620				4.620
	Rifle, 7.62-mm, semiauto,											
	lt bbl-----	300	0.055	0.079	33	9,900	100	181.500	100	260.700	100	260.700
												996.780
												=0.4984
												short tons
HQ & HQ DET, SIG GP, ARMY (TOE 11-32E) ¹												
	Launcher, rocket, 3.5-in.---	6	9.000	17.700	5	30		3	135.000	3	265.500	400.500
	Pistol, cal .45-----	21	0.044	0.057	13	273	21	12.012				12.012
	Rifle, 7.62-mm, semiauto,											
	lt bbl-----	300	0.055	0.079	50	150.000	100	275.000	100	395.000	100	395.000
												1,065.000
												1,477.512
												=0.7388
												short tons
SIG CABLE CONST BN (TOE 11-45D)												
	Gun, mach, cal .50, hv bbl.	525	0.390	0.411	84	44,100		315	10,319.400	210	7,250.040	17,569.440
	Launcher, rocket, 3.5-in.---	6	9.000	17.700	15	90		3	405.000	3	796.500	1,201.500
	Pistol, cal .45-----	21	0.044	0.057	8	168	21	7.392				7.392
	Rifle, 7.62-mm, semiauto,											
	lt bbl-----	300	0.055	0.079	866	259,800	100	4,763.000	100	6,841.400	100	6,841.400
												18,445.800
												37,224.132
												=18.6121
												short tons
HQ & HQ DET, CMBT EW SIG BN, CORPS (TOE 11-66D)												
	Gun, mach, cal .50, hv bbl.	525	0.390	0.411	3	1,575		315	368.550	210	258.930	627.480
	Launcher, rocket, 3.5-in.---	6	9.000	17.700	3	18		3	81.000	3	159.300	240.300
	Pistol, cal .45-----	21	0.044	0.057	4	84	21	3.696				3.696
	Rifle, 7.62-mm, semiauto,											
	lt bbl-----	300	0.055	0.079	38	11,400	100	209.000	100	300.200	100	300.200
												809.400
												1,680.876
												=0.8404
												short tons

1	2	3	4	5	6	7	8	9	10	11	12	13
Unit and type munition	Rd per wpn	Wt per rd (lb)	Wt per rd (lb) packaged	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
CMBT EW SIG CO, INF (TOE 11-67D)												
Gun, mach, cal .50, hv bbl	525	0.390	0.411	2	1,050			315	245.700	210	172.620	418.320
Launcher, rocket, 3.5-in.	6	9.000	17.700	1	6			3	27.000	3	53.100	80.100
Pistol, cal .45	21	0.044	0.057	10	210	21	9.240					9.240
Rifle, 7.62-mm, semiauto, lt bbl	300	0.055	0.079	155	46,500	100	852.500	100	1,224.500	100	1,224.500	3,301.500
												3,809.160 =1.9046 short tons
CMBT EW SIG CO, ARMD (TOE 11-68D)												
Gun, mach, cal .50, hv bbl	525	0.390	0.411	2	1,050			315	245.700	210	172.620	418.320
Launcher, rocket, 3.5-in.	6	9.000	17.700	1	6			3	27.000	3	53.100	80.100
Pistol, cal .45	21	0.044	0.057	10	210	21	9.240					9.240
Rifle, 7.62-mm, semiauto, lt bbl	300	0.055	0.079	130	39,000	100	715.000	100	1,027.000	100	1,027.000	2,769.000
												3,276.660 =1.6383 short tons
CMBT AREA SIG BN, ARMY (TOE 11-85E)												
Gun, mach, 7.62-mm, lt wt, GP	3,000	0.063	0.089	14	42,000			1,500	1,323.000	1,500	1,869.000	3,192.000
Launcher, rocket, 3.5-in.	6	9.000	17.700	13	78			3	351.000	3	690.300	1,041.300
Pistol, cal .45	21	0.044	0.057	8	168	21	7.392					7.392
Rifle, 7.62-mm, semiauto, lt bbl	300	0.055	0.079	806	241,800	100	4,433.000	100	6,367.400	100	6,367.400	17,167.800
												21,408.492 =10.7042 short tons

ARMY SIG BN
(TOE 11-95D)

Gun, mach, cal .50, hv bbl.	525	0.390	0.411	4	2,100			315	491.400	210	345.240	836.640
Launcher, rocket, 3.5-in.	6	9.000	17.700	4	24			3	108.000	3	212.400	320.400
Pistol, cal .45	21	0.044	0.057	51	1,071	21	47.124					47.124
Rifle, 7.62-mm, semiauto, lt bbl.	300	0.055	0.079	1,062	318,600	100	5,841.000	100	8,389.800	100	8,389.800	22,620.600

23,824.764
=11.9124
short tons

HQ & HQ DET, SIG GP
(TOE 11-122F)¹

Gun, mach, cal .50, hv bbl.	525	0.390	0.411	1	525			315	122.850	210	86.310	309.160
Launcher, grenade, 40-mm.	26	0.500	0.806	1	26			8	4.000	18	14.508	18.508
Launcher, rocket, 3.5-in.	6	9.000	17.700	3	18			3	81.000	3	159.300	240.300
Pistol, cal .45	21	0.044	0.057	6	126	21	5.544					5.544
Rifle, 7.62-mm, semiauto, lt bbl.	300	0.055	0.079	43	12,900	100	236.500	100	339.700	100	339.700	915.900

1,389.412
=0.6947
short tons

SIG OP CO,
MEDIUM HQ
(TOE 11-127E)

Gun, mach, 7.62-mm, lt wt, GP	3,000	0.063	0.089	1	3,000			1,500	94.500	1,500	133.500	228.000
Launcher, grenade, 40-mm.	26	0.500	0.806	13	338			8	52.000	18	188.604	240.604
Launcher, rocket, 3.5-in.	6	9.000	17.700	2	12			3	54.000	3	106.200	160.200
Pistol, cal .45	21	0.044	0.057	30	630	21	27.720					27.720
Rifle, 7.62-mm, semiauto, lt bbl.	300	0.055	0.079	203	60,900	100	1,116.500	100	1,603.700	100	1,603.700	4,323.900

4,980.424
=2.4902
short tons

SIG CO, COMM
CEN OP
(TOE 11-137E)

Gun, mach, 7.62-mm, lt wt, GP	3,000	0.063	0.089	1	3,000			1,500	94.500	1,500	133.500	228.000
Launcher, grenade, 40-mm.	26	0.500	0.806	22	572			8	88.000	18	319.176	407.176

1	2	3	4	5	6	7	8	9	10	11	12	13
Unit and type munition	Rd per wpn	Wt per rd (lb)	Wt per rd (lb) packaged	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
Pistol, cal .45-----	21	0.044	0.057	23	483	21	21.252					21.252
Rifle, 7.62, semiauto, lt bbl.	300	0.055	0.079	284	85,200	100	1,562.000	100	2,243.600	100	2,243.600	6,049.200
												6,705.628 =3.3528 short tons
SIG OPNS CO, SMALL HQ (TOE 11-147E)												
Gun, mach, 7.62-mm, lt wt, GP-----	3,000	0.063	0.089	1	3,000			1,500	94.500	1,500	133.500	228.000
Launcher, grenade, 40-mm.	26	0.500	0.806	6	156			8	24.000	18	87.048	111.048
Launcher, rocket, 3.5-in.	6	9.000	17.700	2	12			3	54.000	3	106.200	160.200
Pistol, cal .45-----	21	0.044	0.057	11	231	21	10.164					10.164
Rifle, 7.62-mm, semiauto, lt bbl-----	300	0.055	0.079	125	37,500	100	687.500	100	987.500	100	987.500	2,662.500
												3,171.912 =1.5860 short tons
SIG SUP & MAINT CO (GS) (TOE 11-159E)												
Gun, mach, 7.62-mm, lt wt, GP-----	3,000	0.063	0.089	1	3,000			1,500	94.500	1,500	133.500	228.000
Launcher, grenade, 40-mm.	26	0.500	0.806	12	312			8	48.000	18	174.096	222.096
Launcher, rocket, 3.5-in.	6	9.000	17.700	2	12			3	54.000	3	106.200	160.200
Pistol, cal .45-----	21	0.044	0.057	13	273	21	12.012					12.012
Rifle, 7.62-mm, semiauto, lt bbl-----	300	0.055	0.079	138	41,400	100	759.000	100	1,090.200	100	1,090.200	2,939.400
												3,561.708 =1.7809 short tons
ARMY EW SIG BN, ARMY (TOE 11-165D)												
Gun, mach, cal .50, hv bbl.	525	0.390	0.411	27	14,175			315	3,316.950	210	2,330.370	5,647.320

AGO 6169A

Launcher, rocket, 3.5-in...	6	9.000	17.700	27	162			3	729.000	3	1,433.700	2,162.700
Pistol, cal .45-----	21	0.044	0.057	10	210	21	9.240					9.240
Rifle, 7.62-mm, semiauto, lt bbl-----	300	0.055	0.079	1,060	318,000	100	5,830.000	100	8,374.000	100	8,374.000	22,578.000
												30,397.260 =15.1986 short tons
ABN CORPS SIG BN (TOE 11-225E)												
Gun, mach, cal .50, hv bbl	525	0.390	0.411	3	1,575			315	368.550	210	258.930	627.480
Launcher, grenade, 40-mm	26	0.500	0.806	19	494			8	76.000	18	275.652	351.652
Launcher, rocket, 3.5-in...	6	9.000	17.700	3	18			3	81.000	3	159.300	240.300
Pistol, cal .45-----	21	0.044	0.057	43	903	21	39.732					39.732
Rifle, 7.62-mm, semiauto, lt bbl-----	300	0.055	0.079	479	143,700	100	2,634.500	100	3,784.100	100	3,784.100	10,202.700
												11,461.864 =5.7309 short tons
TEAM NA, CRYPTO SPT TYPE A (TOE 11-500D)												
Pistol, cal .45-----	21	0.044	0.057	8	168	21	7.392					7.392
												7.392 =0.0037 short tons
TEAM NB, CRYPTO SPT TYPE B (TOE 11-500D)												
Pistol, cal .45-----	21	0.044	0.057	18	378	21	16.632					16.632
Rifle, 7.62-mm, semiauto, lt bbl-----	300	0.055	0.079	2	600	100	11.000	100	15.800	100	15.800	42.600
												59.232 =0.0296 short tons
TEAM NC, CRYPTO SPT TYPE C (TOE 11-500D)												
Pistol, cal .45-----	21	0.044	0.057	26	546	21	24.024					24.024

5-99

FM 101-10-1

1	2	3	4	5	6	7	8	9	10	11	12	13
Unit and type munition	Rd per wpn	Wt per rd (lb)	Wt per rd (lb) packaged	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
Rifle, 7.62-mm, semiauto, lt bbl.....	300	0.055	0.079	3	900	100	16.500	100	23.700	100	23.700	63.900
TEAM RF, TRANS MUX FAC (TOE 11-500D)												87.924 =0.0440 short tons
Gun, mach, 7.62-mm, lt wt, GP.....	3,000	0.063	0.089	1	3,000			1,500	94.500	1,500	133.500	228.000
Rifle, 7.62-mm, semiauto, lt bbl.....	300	0.055	0.079	28	8,400	100	154.000	100	221.200	100	221.200	596.400
TEAM RM, SEARCH RADAR MAINT (TOE 11-500D)												824.400 =0.4122 short tons
Rifle, 7.62-mm, semiauto, lt bbl.....	300	0.055	0.079	5	1,500	100	27.500	100	39.500	100	39.500	106.500
TEAM RR, AD SYS MAINT (ADA GP) (TOE 11-500D)												106.500 =0.0533 short tons
Rifle, 7.62-mm, semiauto, lb bbl.....	300	0.055	0.079	34	10,200	100	187.000	100	268.600	100	268.600	724.200
												724.200 =0.3621 short tons

AGO 6189A

TEAM RS, AD SYS
MAINT (ADA BN)
(TOE 11-500D)

Rifle, 7.62-mm, semiauto,
lt bbl-----

300 0.055 0.079 10 3,000 100 55.000 100 79.000 100 79.000

213.000

213.000
=0.1065
short tons

TEAM TA, SIG
INTEL COLL
(TOE 11-500D)

Rifle, 7.62-mm, semiauto,
lt bbl-----

300 0.055 0.079 4 1,200 100 22.000 100 31.600 100 31.600

85.200

85.200
=0.0426
short tons

TEAM TB, SIG
INTEL OFF SEC
(TOE 11-500D)

Pistol, cal .45-----
Rifle, 7.62-mm, semiauto,
lt bbl-----

21 0.044 0.057 1 21 21 0.924
300 0.055 0.079 5 1,500 100 27.500 100 39.500 100 39.500

0.924

106.500
107.424
=0.0537
short tons

TEAM TC,
EQUIP EVAL
(TOE 11-500D)

Rifle, 7.62-mm, semiauto,
lt bbl-----

300 0.055 0.079 5 1,500 100 27.500 100 39.500 100 39.500

106.500

106.500
=0.0533
short tons

TEAM TE, ADPS
CEN (LARGE)
(TOE 11-500D)

Pistol, cal .45-----

21 0.044 0.057 1 21 21 0.924

0.924

S-101

FM 101-10-1

1	2	3	4	5	6	7	8	9	10	11	12	13
Unit and type munition	Rd per wpn	Wt per rd (lb)	Wt per rd (lb) packaged	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
Rifle, 7.62-mm, semiauto, lt bbl.....	300	0.055	0.079	33	9,900	100	181.500	100	260.700	100	260.700	702.900
TEAM, TF, ADPS CEN (MEDIUM) (TOE 11-500D)												703.824 =0.3519 short tons
Rifle, 7.62-mm, semiauto, lt bbl.....	300	0.055	0.079	25	7,500	100	137.500	100	197.500	100	197.500	532.500
TEAM TG, ADPS CEN (SMALL) (TOE 11-500D)												532.500 =0.2663 short tons
Rifle, 7.62-mm, semiauto, lt bbl.....	300	0.055	0.079	12	3,600	100	66.000	100	94.800	100	94.800	255.600
												255.600 =0.1278 short tons

¹ TOE 11-122F, when published, will supersede TOE 11-22E and TOE 11-82E.

5-43. Ammunition Supply Data—Army Security Agency Units—Basic Load

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	Total round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
HQ, & HQ CO, ASA GP, Field Army (TOE 32-52D)											
Gun, mach, cal .50-----	420	0.390	2	840			420	327.60			327.60
Pistol, semiauto, cal .45-----	21	0.057	9	189	21	10.77					10.77
Rifle, semiauto, 7.62-mm-----	100	0.081	248	24,800	100	2,008.80					2,008.80
											2,347.17 = 1.17 tons
HQ & HQ CO, ASA BN CORPS (TOE 32-56E)											
Gun, mach, cal .50-----	420	0.390	2	840			420	327.60			327.60
Pistol, semiauto, cal .45-----	21	0.057	4	84	21	4.79					4.79
Rifle, semiauto, 7.62-mm-----	100	0.081	183	18,300	100	1,482.30					1,482.30
											1,814.69 = .91 tons
ASA OP CO (A) (TOE 32-67E)											
Launcher, rkt, 3.5-in.-----	3	17.700	3	9			3	159.30			159.30
Gun, mach, cal .50-----	420	0.390	7	2,940			420	1,146.60			1,146.60
Pistol, semiauto, cal .45-----	21	0.057	1	21	21	1.20					1.20
Rifle, semiauto, 7.62-mm-----	100	0.081	346	34,600	100	2,802.60					2,802.60
											4,109.70 = 2.05 tons
ASA PROCESSING CO (TOE 32-77D)											
Launcher, rkt, 3.5-in.-----	3	17.700	2	6			3	106.20			106.20
Gun, mach, cal .50-----	420	0.390	2	840			420	327.60			327.60
Pistol, semiauto, cal .45-----	21	0.057	1	21	21	1.20					1.20
Rifle, semiauto, 7.62-mm-----	100	0.081	235	23,500	100	1,903.50					1,903.50
											2,338.50 = 1.17 tons

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	Total round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
ASA SECURITY CO (TOE 32-78D)											
Launcher, rkt, 3.5-in.....	3	17.700	2	6			3	106.20			106.20
Gun, mach, cal .50.....	420	0.390	2	840			420	327.60			327.60
Pistol, semiauto, cal .45.....	21	0.057	1	21	21	1.20					1.20
Rifle, semiauto, 7.62-mm.....	100	0.081	132	13,200	100	1,069.20					1,069.20
											1,504.20 = .75 tons
ASA DIV SPT CO (TOE 32-57F) (Inf) (Armd) (Mech)											
Gun, mach, 7.62-mm.....	1,760	0.081	3	5,280			3	427.68			427.68
Pistol, semiauto cal .45.....	21	0.057	1	21	21	1.20					1.20
Rifle, semiauto, 7.62-mm.....	100	0.081	*232	23,200	100	1,879.20					1,879.20
											2,308.08 = 1.15 tons
ASA DIV SPT CO (TOE 32-57F) (Airborne)											
Gun, mach, 7.62-mm.....	1,760	0.081	3	5,280			3	427.68			427.68
Pistol, semiauto, cal .45.....	21	0.057	38	798	21	45.49					45.49
Rifle, semiauto, 7.62-mm.....	100	0.081	193	19,300	100	1,563.30					1,563.30
											2,036.47 = 1.02 tons

* Total rifle, semi-auto, 7.62-mm should be computed at 230 when in support of Inf Div.

5-44. Ammunition Supply Data—Military Police Units (Nondivisional)—Basic Load

5-44. Ammunition Supply Data—Military Police Units (Continued), 1960-1964											
1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Round per wpn	Weight per round (lb)	Total wpn	Total round	Carried on individual		Carried on vehicle		Bulk loaded		Total weight (lb)
					Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	Round per wpn	Total weight (lb)	
MP BN, ARMY (TOE 19-35E)											
Gun, mach, cal .50 BRG hv bbl.....	525	0.390	4	2,100			315	491.40	210	327.60	819.00
Gun, mach, 7.62-mm, lt GP.....	3,080	0.080	9	27,720			1,540	1,108.80	1,540	1,108.80	2,217.60
Launcher, rocket, 3.5-in.....	6	17.700	9	54			3	477.90	3	477.90	955.80
Pistol, cal .45.....	21	0.057	35	735	21	41.90					41.90
			or	or		or					or
			512	10,752		612.76					612.76
Revolver, cal .38 det sp, 2-in.....	18	0.041	7	126	18	5.17					5.17
Rifle, 7.62-mm, semiauto, lt bbl.....	300	0.072	611	183,300	100	4,399.20	100	4,399.20	100	4,399.20	13,197.60
											17,237.07 or 17,807.93 = 8.61 or 8.90 short tons
HQ & HQ DET, MP BN (TOE 19-36E)											
Gun, mach, cal .50, BRG hv bbl.....	525	0.390	1	525			315	122.85	210	81.90	204.75
Pistol, cal .45.....	21	0.057	11	231	21	13.17					13.17
Revolver, cal .38 det sp, 2-in.....	18	0.041	7	126	18	5.17					5.17
Rifle, 7.62-mm, semiauto, lt bbl.....	300	0.072	47	14,100	100	338.40	100	338.40	100	338.40	1,015.20
											1,238.29 = .62 short tons
MILITARY POLICE CO, CORPS, ABN CORPS, ARMY (TOE 19-37E)											
Gun, mach, cal .50 BRG, hv bbl.....	525	0.390	1	525			315	122.85	210	81.90	204.75
Gun, mach, 7.62-mm, lt GP.....	3,080	0.080	3	9,240			1,540	369.60	1,540	369.60	739.20
Launcher, rocket, 3.5-in.....	6	17.700	3	18			3	159.30	3	159.30	318.60
Pistol, cal .45.....	21	0.057	8	168	21	9.58					9.58
			or	or		or					or
			167	3,507		199.90					199.90
Rifle, 7.62-mm, semiauto, lt bbl.....	300	0.072	188	56,400	100	1,353.60	100	1,353.60	100	1,353.60	4,060.80
											5,332.93 or 5,523.25 = 2.66 or 2.76 short tons

5-45. Ammunition Supply Data—Service Units—Basic Load

For planning purposes, assume service units not likely to become involved in direct combat with the enemy to carry a basic load of ammunition as follows:

1	Weapon	2	3
		Rounds per weapon	
		Secure area	Area of guerrilla activity
2	Carbine, cal .30 -----	60	90
3	Gun, mach, cal .30 -----	1,500	2,000
4	Gun, mach, cal .50, Brg, hv bbl, flex -----	420	525
5	Gun, mach, 7.62-mm, lt-weight, GP -----	1,760	2,200
6	Gun, submach, cal .45 -----	60	90
7	Launcher, rkt, 3.5-in -----	3	3
8	Pistol, semiauto, cal .45 -----	21	21
9	Rifle, auto, cal .30, Brg -----	240	500
10	Rifle, auto-semiauto, 7.62-mm, selective, hv bbl -----	260	500
11	Rifle, semiauto, 7.62-mm, lt bbl -----	100	160
12	Rifle, US, cal .30 -----	96	144

Section VI. MISCELLANEOUS SUPPLY**5-46. Water Supply***a. Water Requirements.*

	1	2	3		4
1	Unit consumer	Conditions of use	Gal per unit Consumer per day		Remarks
			Temper- ate/cold climate	Desert/ jungle	
2	Man -----	In combat:			
		Minimum -----	½-1	¹ 2-3	For eating and drinking only, periods not to exceed 3 days.
		Normal -----	2 3	¹ 3-4 ² 6	When field rations are used. Drinking plus small amount for cooking or personal hygiene.
		March or bivouac -----	2	² 5	Minimum for all purposes.
		Temporary camp -----	5	-----	Desirable for all purposes (does not include bathing).
		Temporary camp with bathing facilities.	15	-----	Includes allowance for water- borne sewage system.
		Semipermanent camp ---	30-60	-----	
		Permanent camp -----	60-100	-----	
3	Vehicle -----	Level and rolling country --	⅓-½	-----	Depending on size of vehicle.
		Mountainous country -----	¼-1	-----	Depending on size of vehicle.
4	Locomotive -----	Standard military -----	Variable	-----	150 gallons per train-mile.
		Commercial -----	Variable	-----	200 gallons per train-mile.

See footnotes at end of table.

1	1	2	3		4
	Unit consumer	Conditions of use	Gal per unit Consumer per day		Remarks
			Temper- ate/cold climate	Desert/ jungle	
5	Hospital -----	Drinking and cooking -----	10 per bed	-----	Minimum; does not include bathing or water for flushing.
		With waterborne sewage -----	50 per bed	-----	Includes water for medical personnel.
6	Impregnating plant, clothing, M2A1.	Maximum impregnating capacity.	2,400	-----	Aqueous process. Includes 2,000 gallons for plant operations and 400 gallons for washing and cleaning purposes.
7	QM bakery company (mobile).	Two 10-hour shifts -----	2,600	-----	Water for making bread and cleaning baking utensils.
8	QM laundry company	Two 10-hour shifts -----	64,000 (4,000 per unit).	-----	
9	QM clothing exchange and bath company.	Two 10-hour shifts -----	360,000 (60,000 per unit).	-----	
10	Truck-mounted 400-gallon decontaminating apparatus.	Decontamination -----	4,000	-----	Water obtained from natural source when available.
11	Chemical base laboratory, M2.	Normal laboratory work -----	300	-----	

¹ For unacclimatized personnel or for all personnel when dry bulb readings exceed 105°F., in the jungle.

² Maximum consumption factor is dependent upon work performed, solar radiation, and other environmental stresses.

b. Water Equipment Issued to Engineer Units.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit	Number of sets ¹	Type purif unit; fresh water GPH	Generator (kw)	Chemicals required (lb/hr) ²	Equipment in each set		Pump discharge (GPM/set) ³		Total Storage Capacity (gal)	Max production (GPH)	Water transport equipment
						Tanks		Distrib	Purif			
						Number	Capacity (gal)					
2	Abn div engr bn.....	4	600	3	1.0	3	1,500	65	10	6,000	2,400	9-2,000 gal
3	Armd, inf, & mech div engr bns.....	5	1,500	10	2.4	3	4,500	125	25	22,500	7,500	
4	Engr combat bn, army.....	4	1,500	10	2.4	3	4,500	125	25	18,000	6,000	
5	Engr const bn.....	2	1,500	10	2.4	3	4,500	125	25	9,000	3,000	
6	Engr co, separate bde, armd, inf, or mech.....	2	1,500	10	2.4	3	4,500	125	25	9,000	3,000	
7	Engr co, separate bde, airborne.....	2	600	3	1.0	3	1,500	65	10	6,000	2,400	
8	Engr WS co.....	9	3,000 (mobile)	10	4.7	3	9,000	125	50	81,000	27,000	
9	Water purif team (GF).....	1	3,000 (base).....	15	4.7	3	9,000	125	50	9,000	3,000	
10	Water purif team (GG).....	4	3,000 (base).....	15	4.7	3	9,000	125	50	36,000	12,000	3-2,000 gal
11	Water transport team (GH).....											
12	Well drilling team (GE).....	2	well drilling sets.....									

¹ Each set can equip one water point.² Each set has chemical supplies for 600 hours of operation: 1/6 of supplies transported with each mobile unit.³ One pump at steady purification rate; others at full rated capacity for distribution (intermittent operation).

c. Distillation Units.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Type	Distillate capacity		Economy lb	Fuel required		Raw water required (GPH)	Mounting	Weight (lb)	Dimensions		
		GPH	GPD ¹	distilled per lb of fuel	Type	GPH				Length	Width	Height
2	Thermo-compression	150	3,000	150	Gasoline	1.5	300	Trailer or skid	5,700 3,200	14'-5" 8'-11"	8'-0" 4'-7"	8'-0" 6'-3"

¹ The distillate capacity in GPD is based on a 20-hour operational day.*d. Water Distribution Equipment.*

1	2
Equipment	Capacity
1	
2	Trailer, cargo, 1½-ton, 2-wheel.....
3	Trailer, tank, water, 2-wheel.....
4	Truck, cargo, 2½-ton, 6 x 6, LWB.....
5	Truck, tank, water, 2½-ton, 6 x 6.....
6	Strlr, tank, water, w2½-ton trk track or.....
7	Unit kitchen.....

60 cans filled
400 gal
100 cans filled
1,000 gal
2,000 gal
5-gal cans, wt 50 lb (filled)

1	2
Equipment	Capacity
7	2-inch suction and discharge.....
8	1½-inch suction and discharge.....

125 GPM at 50-ft head
65 GPM at 50-ft head

5-47. Adjutant General Supplies

1	2	3	4	5
Item	Pounds per man per day	Short tons per 1,000 men per month	Measurement tons per 1,000 men per month	Sacks or pouches of mail per 1,000 men per month
1				
2	Forms and publications: Total forms and publications.....	0.033	0.500	1.00
3	Postal: Letter mail ¹	0.028	0.421	² 2.41 ³ 24.0
4	Parcel post ⁴	0.166	2.490	⁵ 15.56
5	Postal supplies.....	0.011	0.171	⁶ 0.60
6	Total postal.....	0.205	3.082	⁷ 124.5

¹ Moved by air.² Computed at 10 pouches per measurement ton (estimated).³ Computed at 35 pounds per pouch of mail (estimated).⁴ Volume may be expected to increase 2.3 times during October and November because of Christmas mail.⁵ Computed at 8 sacks per measurement ton (estimated).⁶ Conversion factor 3.5 measurement tons per short ton (estimated).⁷ Computed at 40 pounds per sack of mail (estimated).*e. Capacities of Other Water Supply Equipment.*

1	2
Equipment	Capacity
1	
2	Deep well pumps: Helical rotor-type.....
3	Turbine type, 6-inch.....
4	Percussion well drilling machine.....
5	Rotary well drilling machine.....
6	Rotary well drilling machine.....
	Surface pumps, centrifugal type gasoline engine drive:

60 GPM against 250-ft head
200 GPM against 200-ft head
6- to 8-inch well, 1,000 to 500 ft
4- to 6-inch well, 350 to 150 ft
4- to 6-inch well, 1,500 to 1,000 ft

5-48. Army Exchange Supplies—Consumption and Replenishment

	1		2	3	4
1	Item		Pounds per man per day	Short tons per man per month	Measure- ment tons per man per month
2	Combat zone: Army in amphibious operations ¹	-----	² 0.533	² 0.008	² 0.020
3	Theater: European ^{3 4}	-----	1.428	0.021	0.043
4	Pacific ^{3 5}	-----	1.571	0.024	0.050

¹ Based on Operation OLYMPIC estimates, 150-day period.² Does not include sundries pack issued with rations, 0.369 pound per man per day.³ Data do not include items procured locally by individual exchanges.⁴ ETO Board Report.⁵ Southwest Pacific Theater planning data, 1945.**5-49. Paper Supply**

	1	2	3	4
1	Unit consumer	Consump- tion tons per day	Maximum production per day	Remarks
2	Psych warfare repro det ¹ (psych war- fare bcst and leaflet bn).	11.25	4,500,000	5¼-in x 8-in leaflets printed both sides. ³
3	Psych warfare organization field or the- ater army. ³	5.00	2,000,000	5¼-in x 8-in leaflets printed both sides. ³

¹ Based on press equipment authorized by TOE 33-57D.² For 8-in. x 10½-in. new sheets, production figures are divided by 2.³ Based on press equipment authorized by TOE 33-500E.**5-50. Special Services Supplies**

	1	2	3
1	Item	Short tons per 10,000 men per month	Measurement tons per 10,000 men per month
2	Donated items: Total donated items -----	0.15	0.5
3	Recreational: Books and magazines ¹ -----	0.75	1.0
4	Music, theatrical, crafts, and miscellaneous ¹ -----	1.00	2.0
5	Sports ¹ -----	0.75	2.0
6	Total recreational ¹ -----	2.50	5.0

¹ Data do not include items procured locally or items procured from any source with nonappropriated funds as defined in AR 230-5.**5-51. Entertainment Motion Picture Service Supplies**

	1	2	3
1	Item	Short tons per 25,000 men per month	Measurement tons per 25,000 men per month
2	Total miscellaneous equipment and supplies -----	0.152	0.247

Section VII. SUPPLY REQUIREMENTS

5-52. Day of Supply—Definitions

The day of supply, as used in this section, is the estimated weight of supplies required to support one man (soldier or officer, air plus ground) in an oversea theater for 1 day, based on total strengths and maintenance tonnage experience over a long period of time. These factors are not considered as including initial equipment of troop units, but they do include tonnages for project equipment and similar supplies (other than civilian or other relief supplies) which are required to support troops. *The tables shown in paragraphs 5-54 through 5-59 supplement the general consumption and flow charts of paragraph 5-53. They are based on historical data for specific locations, specific types of combat, and specific ground-to-air troop ratios. For information on the establishment of ammunition day of supply and specification of theater stockage levels, see SB 38-26 and AR 11-8.*

5-53. General Consumption and Flow Charts

a. Introduction and Explanation of Charts.

- (1) This paragraph illustrates, with a series of seven graphical charts and supporting tables, (figs. 5-1 through 5-7) the flow of *replacement and consumption supplies* from CONUS or local procurement to consumer groups in the theater of operations.
- (2) The unit of measure, *tons per division slice*, is considered the most appropriate for long-range planning for supply of the Army and Air Force in a theater of operations. The division slice is defined (para 4-6) as including the strength of an average division plus proportionate shares of the total corps, field army zone, and theater overhead units. A troop location ratio has been assumed, illustrated by the human figures shown on the first chart below. Each figure represents approximately 10,000 of the 43,250 men making up the division slice. For illustrative purposes in the following charts, it has been assumed that all

divisions in the theater are occupying sectors along the front. In practice, varying proportions of these troops will be in reserve, in rest areas, in transit, or in staging. Also shown in a similar fashion is the proportionate air strength in the theater, based on a ratio of two wing slices (defined in para 4-6) per division slice.

- (3) The charts include, in addition to the supplies consumed by the Army in the theater, the quantities of supplies brought into the theater for the use of the U.S. Air Force. All are shown in terms of tons per division slice per day. In all instances, figures based on Air Force strength include those Army troops, part of the wing slice, required within the theater because of the presence of Air Force elements, which are provided Army Combat service support. To separate the quantity of supplies brought into the theater for the Army from those supplies brought in for the Air Force, a horizontal dotted line has been drawn.
- (4) The flow of supplies, in terms of tons per division slice per day, shown in each of the charts is supported by *pounds per man per day* data displayed beneath each chart. These pounds per man per day figures *approximate* those found in the remainder of the chapter.
- (5) *Procurement in the theater* is indicated in each chart, except for classes V and V (A), as a possible source of supply. The quantity thus available would decrease proportionately the amount to be procured from CONUS.
- (6) *Buildup of theater levels* is not included in this series of charts. However, it can be determined easily by a fractional increase in the amounts shown. *For example*, if it is desired to establish a theater reserve of 30 days of supply, and accomplish this buildup in 120 days, a fractional increase of 30/120, or one-fourth, can be made in the amounts shown here.

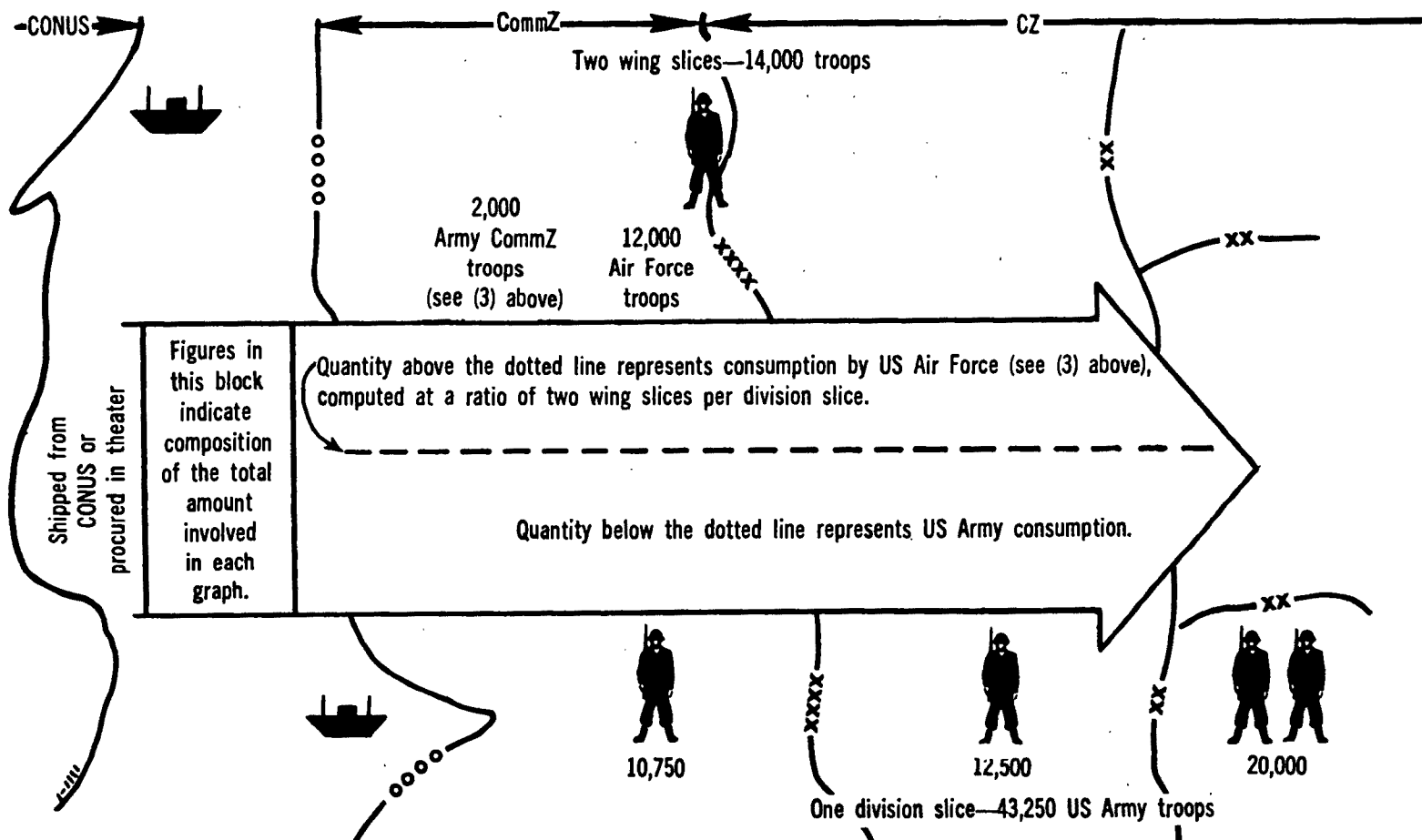
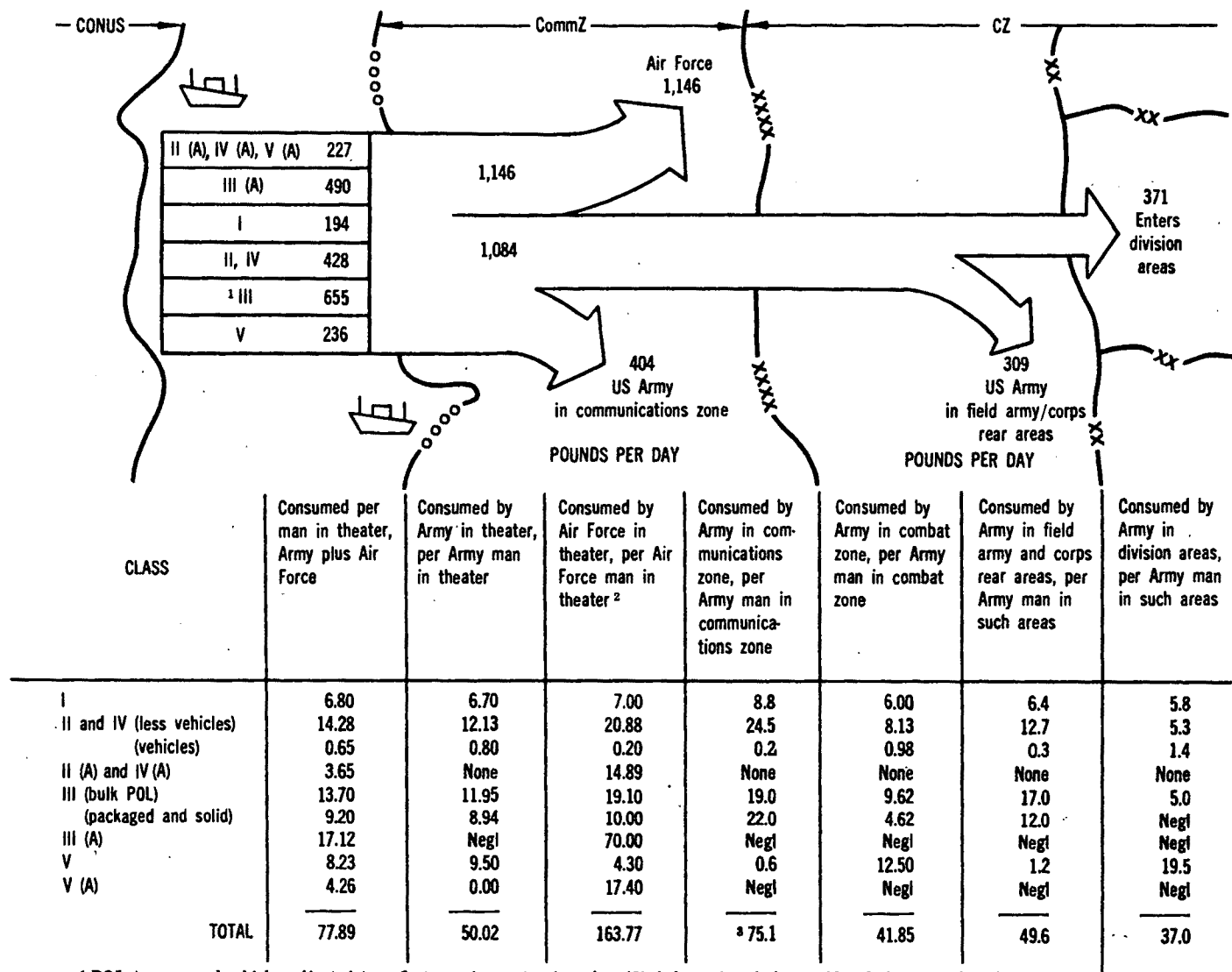


Figure 5-1. General Consumption and Flow Chart.

b. Short Tons Per Division Slice Per Day—All Classes (based on World War II and Korean experience data) (fig. 5-2).



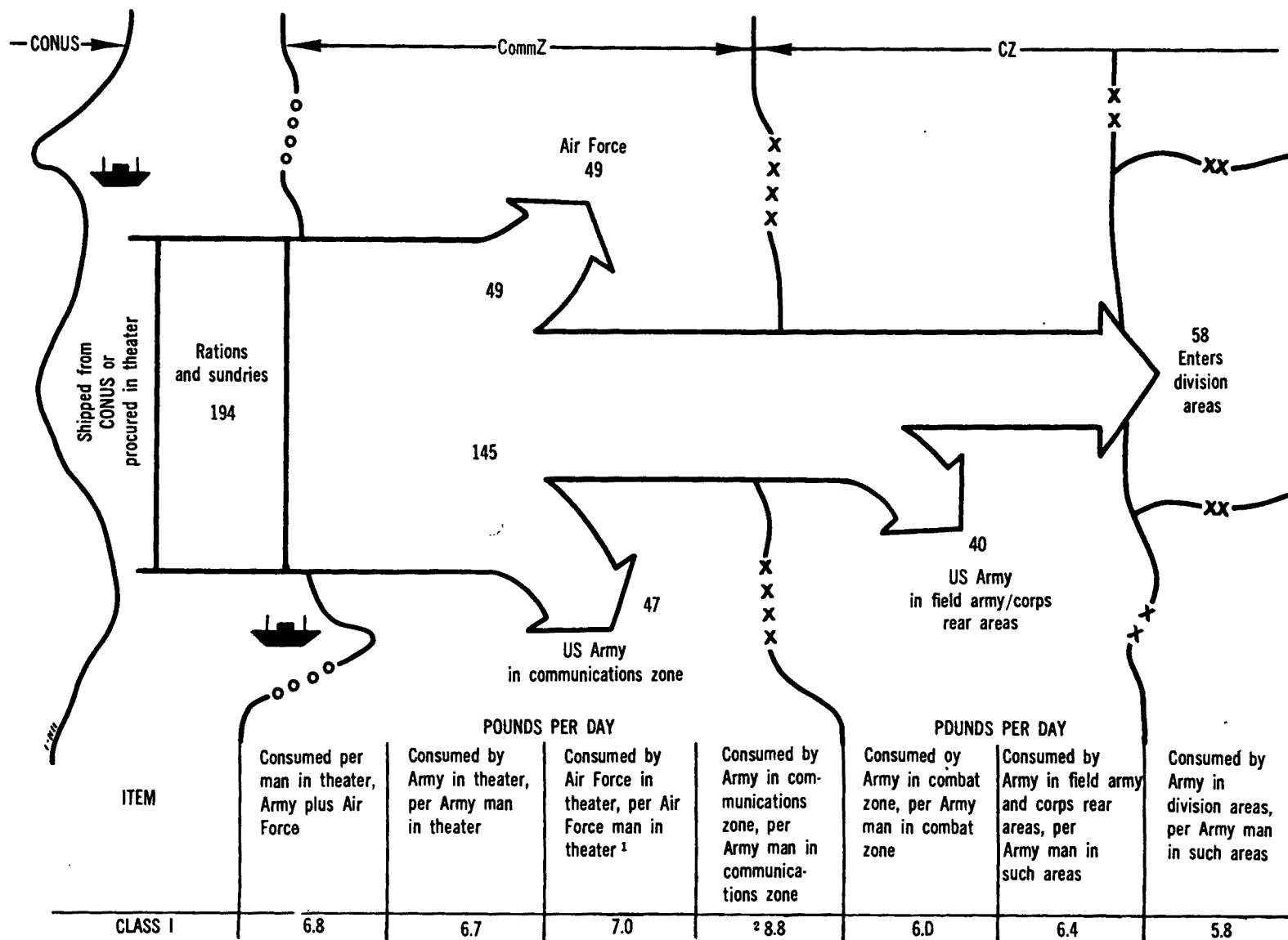
¹ POL tonnages should be adjusted to reflect requirements given in e(2) below when it is considered that data based on assumed mileages and flight times are more valid than World War II and Korean experience data.

² Includes Army troops required within the theater because of the presence of Air Force elements.

³ This relatively greater figure is due to inclusion in this column of diversions to civilians, prisoners of war, and Allies and miscellaneous theater-wide losses.

Figure 5-2

c. Short Tons Per Division Slice Per Day—Class I (based on World War II and Korean experience data) (fig.5-3).

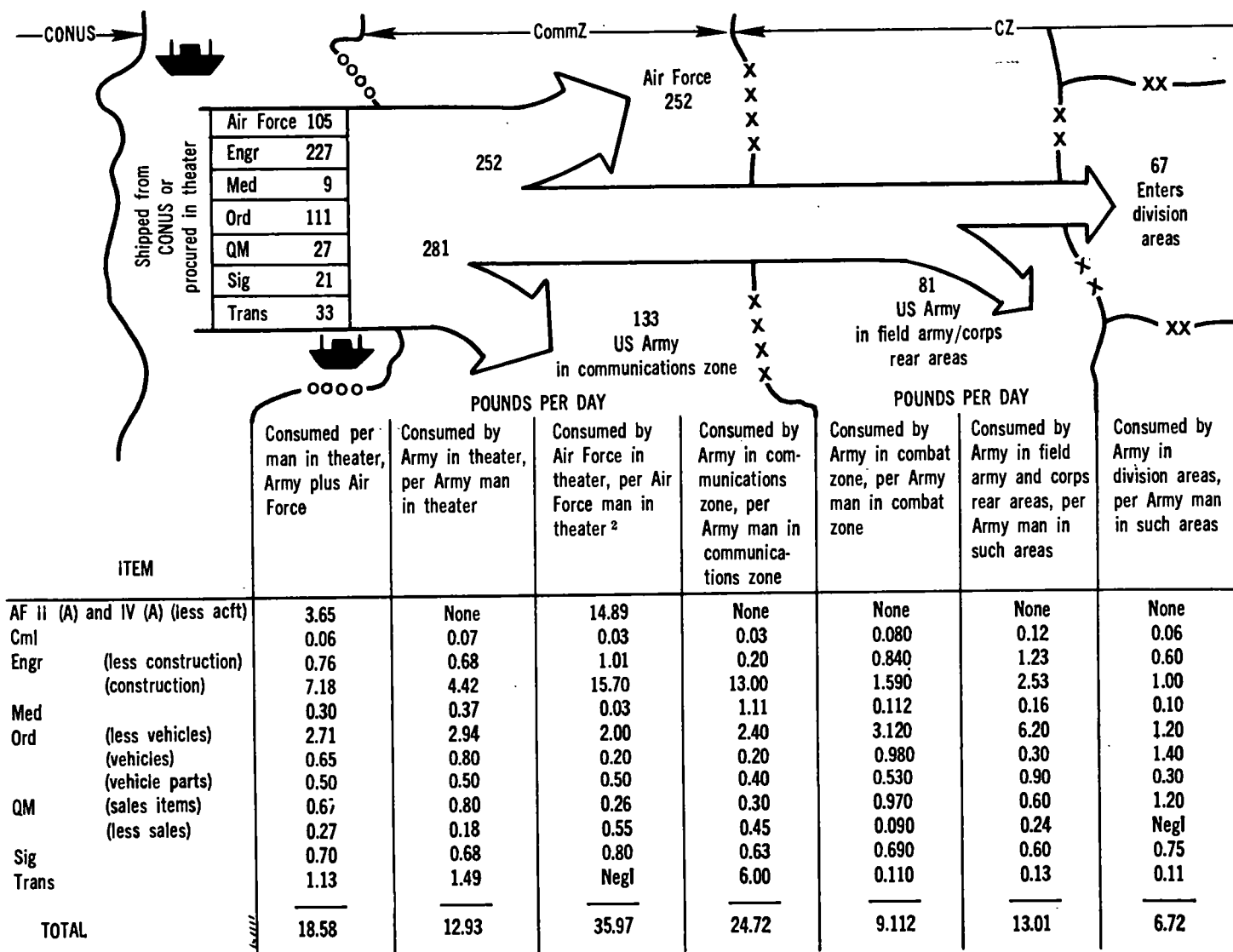


¹ Includes Army troops required within the theater because of the presence of Air Force elements.

² This relatively greater figure is due to inclusion in this column of diversions to civilians, prisoners of war, and Allies and miscellaneous theater-wide losses.

Figure 5-3

d. Short Tons Per Division Slice Per Day—Classes II, IV, II(A), and IV(A) ¹ (based on World War II and Korean experience data) (fig. 5-4).



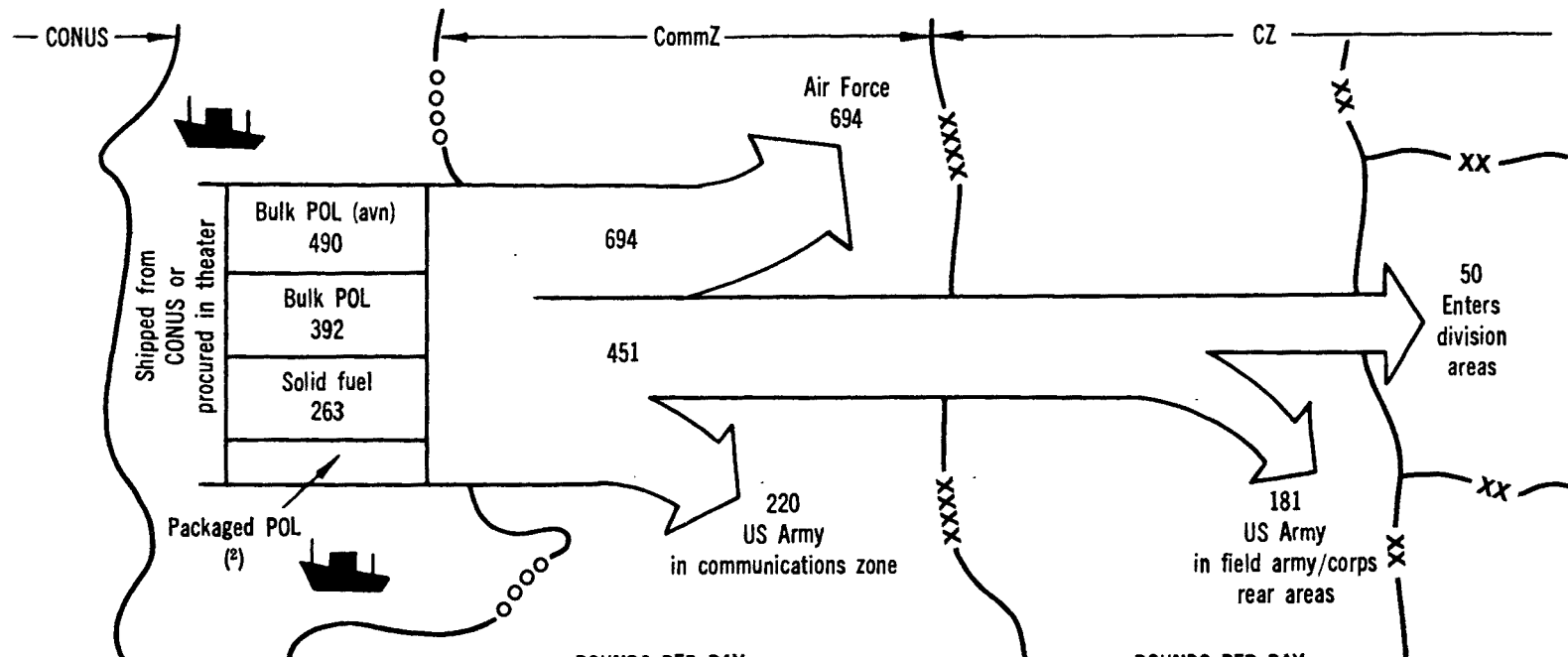
¹ Nongas conditions.

² Includes Army troops required within the theater because of the presence of Air Force elements.

Figure 5-4

e. Classes III and III(A).

(1) Short tons per division slice per day—classes III and III(A) (based on World War II and Korean experience data) (fig. 5-5).

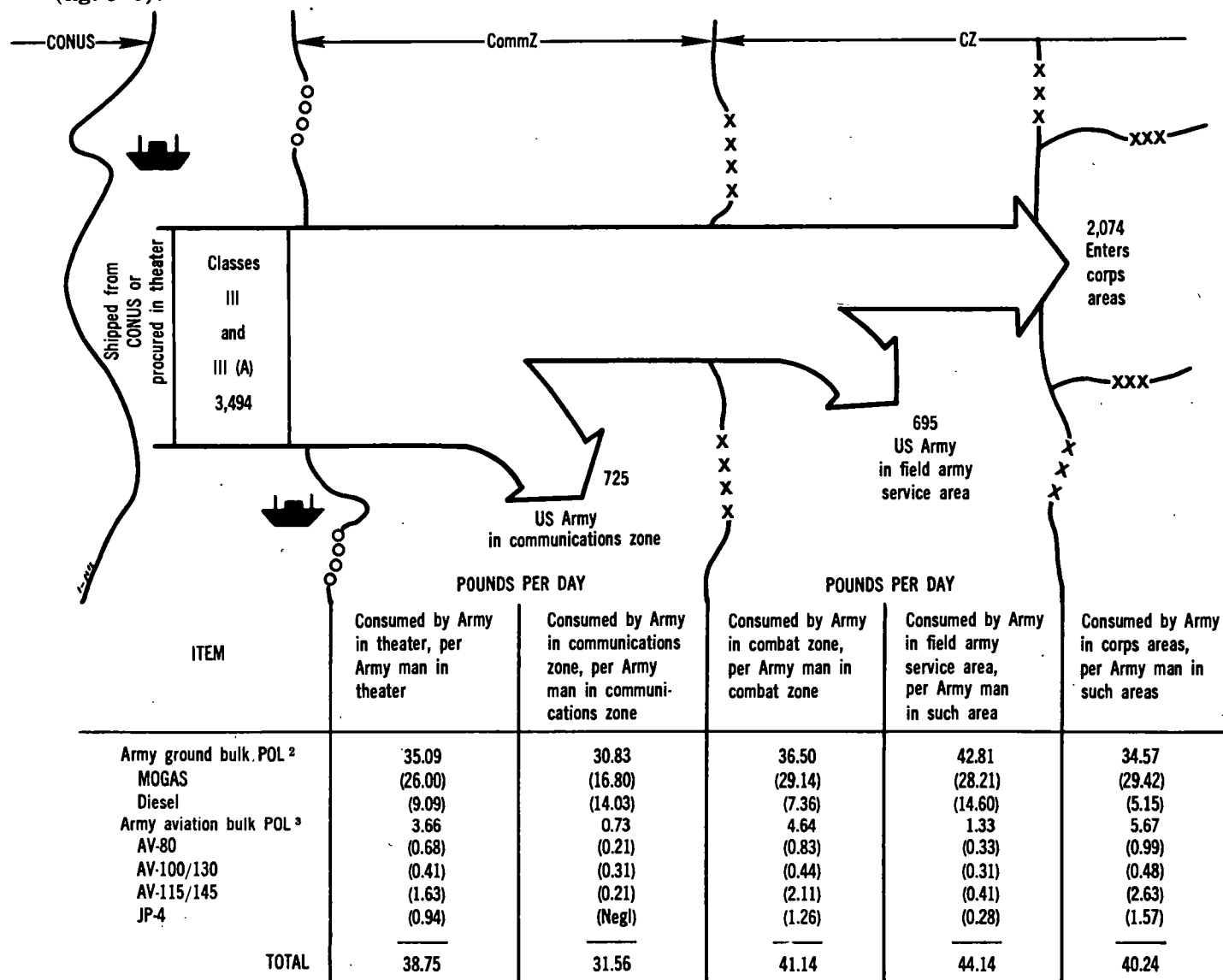


¹ Includes Army troops required within the theater because of the presence of Air Force elements.

² Because of the variety of means of distribution, bulk and packaged POL cannot be segregated in this table.

Figure 5-5

(2) Short tons per corps slice per day—classes III and III(A) (based on assumed mileages and flight times for POL).¹ (fig. 5-6).



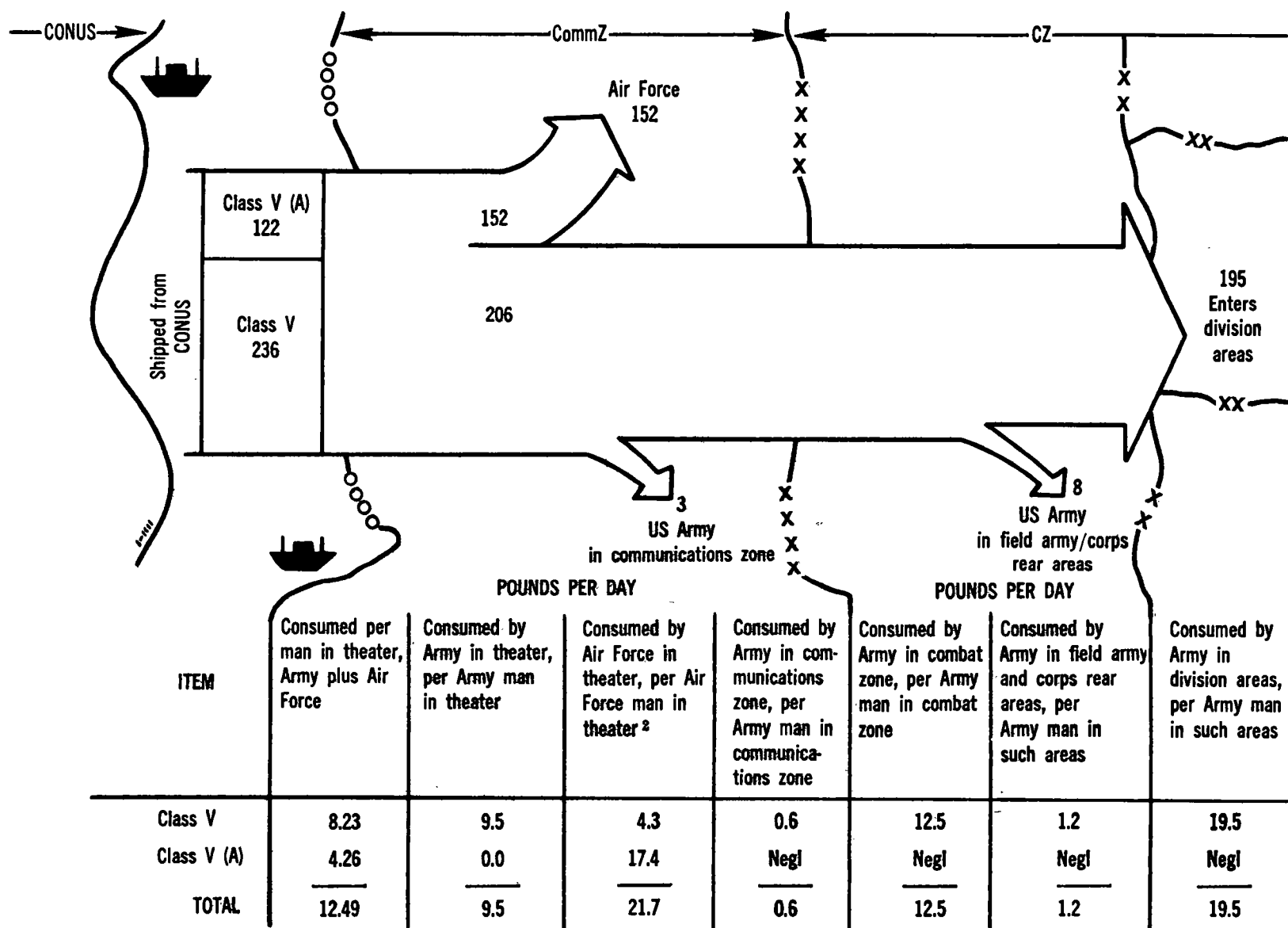
¹ Consumption factors may be adjusted upward or downward to satisfy revised assumptions pertaining to mileage or flight time.

² Based on an assumed mileage of 50 miles per day for all vehicles.

³ Based on 4 hours' flying time per day for all aircraft.

Figure 5-6

f. Short Tons Per Division Slice Per Day—Classes V and V(A)¹ (based on World War II and Korean experience data). (fig. 5-7).



¹ Nongas conditions.

² Includes Army troops required within the theater because of the presence of Air Force elements.

Figure 5-7

5-54. European Theater*

1	2	3	4	5	6
Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage factor
2 Class I--rations.....	7.170	0.108	2.1	0.227	0.261
Class II:					
3 QM clothing and equipage.....	0.426	0.006	2.0	0.012	0.014
4 QM general supplies.....	0.305	0.005	2.8	0.014	0.016
5 Ordnance vehicle replacement.....	0.620	0.009	2.2	0.020	0.023
6 Engineer.....	0.630	0.009	3.3	0.030	0.035
7 Ordnance.....	2.710	0.041	1.8	0.074	0.085
8 Chemical (includes class IV).....	0.120	0.002	2.3	0.005	0.006
9 Signal (includes class IV).....	0.725	0.011	3.8	0.042	0.048
10 Medical (includes class IV).....	0.300	0.005	2.5	0.013	0.015
11 Total class II.....	5.836	0.088		0.210	0.242
Class III:					
Bulk: ³					
12 Motor gasoline.....	9.100	0.137	1.5	0.206	0.237
13 Diesel fuel.....	1.420	0.021	1.5	0.032	0.037
14 Army aviation gasoline.....	0.640	0.010	1.5	0.015	0.017
15 Heating fuel.....	6.500	0.098	1.5	0.147	0.169
16 Subtotal.....	17.660	0.266		0.400	0.460
Packaged: ³					
17 Motor gasoline ⁴	0.600	0.009	1.5	0.014	0.016
18 Diesel fuel ⁴	0.080	0.001	1.5	0.002	0.002
19 Army aviation gasoline.....	0.040	0.001	1.5	0.002	0.002
20 Heating fuel ⁴	0.430	0.006	1.5	0.009	0.010
21 Engine oil.....	0.300	0.005	1.5	0.008	0.009
22 Gear lubricant.....	0.060	0.001	1.5	0.002	0.002
23 Greases.....	0.030	Negl	1.5	Negl	Negl
24 Army aviation greases and lubricants.....	0.020	Negl	1.5	Negl	Negl
25 Other.....	0.150	0.002	1.5	0.003	0.003
26 Subtotal.....	1.710	0.025		0.040	0.044
27 Total class III.....	19.370	0.291		0.440	0.504
Class IV:					
28 Medical (included in class II).....					
29 Ordnance motor maintenance.....	0.510	0.008	1.0	0.008	0.009
30 QM sales items.....	2.000	0.030	1.7	0.051	0.059
31 AF supply and replacement.....	2.840	0.043	4.0	0.172	0.198
32 Engineer construction material.....	7.280	0.109	1.5	0.164	0.189
33 Signal (included in class II).....					
34 Chemical (included in class II).....					
35 Transportation.....	0.140	0.002	2.4	0.005	0.006
36 Total class IV.....	12.770	0.192		0.400	0.461

* Nongas conditions; based on World War II and Korean experience data.
See footnotes at end of table.

	1	2	3	4	5	6
1	Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage factor
	Class V:					
37	Ammunition (less AF).....	3.640	0.055	0.9	0.050	0.058
38	AF ammunition.....	4.410	0.066	0.9	0.059	0.068
39	Chemical.....	0.110	0.002	0.9	0.002	0.002
40	Total class V.....	8.160	0.123	-----	0.111	0.128
41	Total, European Theater.....	53.111	0.801	-----	1.385	1.592

¹ Conversion factors are based on average cubage for each item. Measurement ton (40 cu ft) of any one item can be found by multiplying its short ton (2,000 lb) weight by that item's conversion factor.

² Represents 95 percent of total theater daily consumption factor.

³ Includes weight of product and packing.

⁴ Represents 5 percent of total theater daily consumption factor.

5-55. Pacific Theater*

	1	2	3	4	5	6
1	Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage factor
2	Class I—rations.....	6.710	0.101	2.1	0.212	0.244
	Class II:					
3	QM clothing and equipage.....	1.000	0.015	2.0	0.030	0.035
4	QM general supplies.....	0.730	0.011	2.8	0.031	0.036
5	Ordnance vehicle replacement.....	0.620	0.009	2.2	0.020	0.023
6	Engineer.....	0.370	0.006	3.3	0.020	0.023
7	Ordnance.....	0.300	0.005	1.8	0.009	0.010
8	Chemical (includes class IV).....	0.440	0.007	2.3	0.016	0.018
9	Signal (includes class IV).....	0.750	0.011	3.8	0.042	0.048
10	Medical (includes class IV).....	0.333	0.005	2.5	0.013	0.015
11	Total class II.....	4.543	0.069	-----	0.181	0.208
	Class III:					
	Bulk: ²					
12	Motor gasoline.....	5.000	0.075	1.5	0.113	0.130
13	Diesel fuel.....	1.420	0.021	1.5	0.032	0.037
14	Army aviation gasoline.....	0.640	0.010	1.5	0.015	0.017
15	Heating fuel.....	5.700	0.086	1.5	0.129	0.148
16	Subtotal.....	12.760	0.192	-----	0.289	0.332
	Packaged: ³					
17	Motor gasoline ⁴	0.250	0.004	1.5	0.006	0.007
18	Diesel fuel ⁴	0.080	0.001	1.5	0.002	0.002

* Nongas conditions; based on World War II and Korean experience data.
See footnotes at end of table.

	1	2	3	4	5	6
1	Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage factor
19	Army aviation gasoline.....	0.040	0.001	1.5	0.002	0.002
20	Heating fuel ⁴	0.370	0.006	1.5	0.009	0.010
21	Engine oil.....	0.300	0.005	1.5	0.008	0.009
22	Gear lubricant.....	0.060	0.001	1.5	0.002	0.002
23	Greases.....	0.030	Negl	1.5	Negl	Negl
24	Army aviation greases and lubricants.....	0.030	Negl	1.5	Negl	Negl
25	Other.....	0.150	0.002	1.5	0.003	0.003
26	Subtotal.....	1.310	0.020	-----	0.032	0.035
27	Total class III.....	14.070	0.212	-----	0.321	0.367
Class IV:						
28	Medical (included in class II).....					
29	Ordnance motor maintenance.....	0.180	0.003	1.0	0.003	0.003
30	QM sales items.....	1.970	0.030	1.7	0.051	0.059
31	AF supply and replacement.....	2.840	0.043	4.0	0.172	0.198
32	Engineer construction material.....	11.900	0.179	1.5	0.268	0.306
33	Signal (included in class II).....					
34	Chemical (included in class II).....					
35	Transportation.....	0.130	0.002	2.4	0.005	0.006
36	Total class IV.....	17.020	0.257	-----	0.499	0.574
Class V:						
37	Ammunition (less AF).....	5.140	0.077	0.9	0.070	0.081
38	AF ammunition.....	3.470	0.052	0.9	0.047	0.054
39	Chemical.....	0.090	0.002	0.9	0.002	0.002
40	Total class V.....	8.700	0.131	-----	0.119	0.137
41	Total, Pacific Theater.....	51.043	0.770	-----	1.332	1.530

¹ Conversion factors are based on average cubage for each item. Measurement ton (40 cu ft) of any one item can be found by multiplying its short ton (2,000 lb) weight by that item's conversion factor.

² Represents 95 percent of total theater daily consumption factor.

³ Includes weight of product and packing.

⁴ Represents 5 percent of total theater daily consumption factor.

5-56. Far East Theater*

Data on classes I, II and IV, and V are not available at time of publication.

	1	2	3	4	5	6
1	Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage factor
Class III: Bulk: ²						
2	Motor gasoline.....	8.600	0.129	1.5	0.194	0.233

* Nongas conditions; based on World War II and Korean experience data.
See footnotes at end of table.

	1	2	3	4	5	6
1	Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage factor
3	Diesel fuel	1.420	0.021	1.5	0.032	0.037
4	Army aviation gasoline	0.640	0.010	1.5	0.015	0.017
5	Heating fuel	9.300	0.140	1.5	0.210	0.242
	Subtotal	19.960	0.300	-----	0.451	0.519
	Packaged: ³					
6	Motor gasoline ⁴	0.500	0.008	1.5	0.012	0.014
7	Diesel fuel ⁴	0.080	0.001	1.5	0.002	0.002
8	Army aviation gasoline	0.040	0.001	1.5	0.002	0.002
9	Heating fuel ⁴	0.610	0.009	1.5	0.014	0.016
10	Engine oil	0.400	0.006	1.5	0.009	0.010
11	Gear lubricant	0.100	0.002	1.5	0.003	0.003
12	Greases	0.040	0.001	1.5	0.002	0.002
13	Army aviation greases and lubricants	0.020	Negl	1.5	Negl	Negl
14	Other	0.150	0.002	1.5	0.003	0.003
15	Subtotal	1.940	0.030	-----	0.047	0.052
16	Total class III	21.900	0.330	-----	0.498	0.571

¹ Conversion factors are based on average cubage for each item. Measurement ton (40 cu ft) of any one item can be found by multiplying its short ton (2,000 lb) weight by that item's conversion factor.

² Represents 95 percent of total theater daily consumption factor.

³ Includes weight of product and packing.

⁴ Represents 5 percent of total theater daily consumption factor.

5-57. Polar Regions**

	1	2	3	4	5	6
1	Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage factor
2	Class I—rations	10.400	0.156	2.1	0.328	0.377
	Class II:					
3	QM clothing and equipage	0.850	0.013	2.9	0.038	0.044
4	QM general supplies	0.400	0.006	2.8	0.017	0.020
5	Ordnance vehicle replacement	0.620	0.009	2.2	0.020	0.023
6	Engineer	0.840	0.013	3.3	0.043	0.049
7	Ordnance	2.000	0.030	1.8	0.054	0.062
8	Chemical (includes class IV)	0.012	0.002	2.3	0.005	0.006
9	Signal (includes class IV)	0.660	0.010	3.8	0.038	0.044
10	Medical (includes class IV)	0.400	0.006	2.5	0.015	0.017
11	Total class II	5.782	0.089	-----	0.230	0.265

** Estimated, based on arctic test operations.

	1	2	3	4	5	6
1	Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage factor
	Class III:					
	Bulk: ²					
12	Motor gasoline.....	10.890	0.163	1.5	0.245	0.282
13	Diesel fuel.....	1.420	0.021	1.5	0.032	0.037
14	Army aviation gasoline.....	0.640	0.010	1.5	0.015	0.017
15	Heating fuel.....	17.100	0.257	1.5	0.386	0.444
16	Subtotal.....	30.050	0.451	-----	0.678	0.780
	Packaged: ³					
17	Motor gasoline ⁴	0.710	0.011	1.5	0.017	0.020
18	Diesel fuel ⁴	0.080	0.001	1.5	0.002	0.002
19	Army aviation gasoline.....	0.040	0.001	1.5	0.002	0.002
20	Heating fuel ⁴	0.900	0.014	1.5	0.021	0.024
21	Engine oil.....	0.800	0.012	1.5	0.018	0.021
22	Gear lubricant.....	0.200	0.003	1.5	0.005	0.006
23	Greases.....	0.050	0.001	1.5	0.002	0.002
24	Army aviation greases and lubricants.....	0.020	Negl	1.5	Negl	Negl
25	Other.....	0.150	0.002	1.5	0.003	0.003
26	Subtotal.....	2.950	0.045	-----	0.070	0.080
27	Total class III.....	33.000	0.496	-----	0.748	0.860
	Class IV:					
28	Medical (included in class II).....					
29	Ordnance motor maintenance.....	0.500	0.008	1.0	0.008	0.009
30	QM sales items.....	2.000	0.030	1.7	0.051	0.059
31	AF supply and replacement ⁵	3.500	0.052	4.0	0.208	0.239
32	Engineer construction material.....	12.000	0.180	1.5	0.270	0.310
33	Signal (included in class II).....					
34	Chemical (included in class II).....					
35	Transportation.....	0.140	0.002	2.4	0.005	0.006
36	Total class IV.....	18.140	0.272	-----	0.542	0.623
	Class V:					
37	Ammunition.....	1.800	0.027	0.9	0.024	0.028
38	AF ammunition ⁶	3.500	0.052	0.9	0.047	0.054
39	Chemical.....	0.110	0.002	0.9	0.002	0.002
40	Total class V.....	5.410	0.081	-----	0.073	0.084
41	Total.....	72.633	1.094	-----	1.921	2.209

¹ Conversion factors are based on average cubage for each item. Measurement ton (40 cu ft) of any one item can be found by multiplying its short ton (2,000 lb) weight by that item's conversion factor.

² Represents 95 percent of total theater daily consumption factor.

³ Includes weight of product and packing.

⁴ Represents 5 percent of total theater daily consumption factor.

⁵ Classes II (A) and IV (A).

⁶ Class V (A).

5-58. Combat Zone and Communications Zone

1	Item	Pounds per man per day		
		Per Army man in combat zone, continental and mass ¹	Per Army man in combat zone, jungle ²	Per Army man in communications zone ³
2	Class I.....	7.690	5.950	8.800
3	Classes II and IV:			
4	Air.....	0.023	0.016	Negl
5	Cml.....	0.040	0.090	0.030
6	Engr.....	2.490	8.950	13.200
7	Med.....	0.112	0.560	1.110
8	Ord.....	4.950	0.860	3.000
9	QM.....	0.928	1.350	0.750
10	Sig.....	0.973	0.346	0.630
11	Trans.....	0.110	Negl	6.000
12	Total II and IV.....	9.630	12.200	24.700
13	Class III.....	12.000	7.530	41.000
14	Class V.....	13.400	8.680	1.400
15	Total.....	43.200	34.400	75.900

¹ Based on operations in Europe, all armies, 24 February 1945 to 28 March 1945.

² Based on Sixth and Eighth Army operations, December 1943 to September 1944.

³ Assumed from theater averages, World War II.

5-59. Field Army and Corps in Combat (Continental Land Mass)

1	Item	Short tons per day	
		Per field army ¹	Per corps ²
2	Class I.....	1,508.0	356.0
3	Classes II and IV:		
4	Air.....	4.5	1.6
5	Cml.....	7.8	1.8
6	Engr.....	488.0	115.0
7	Med.....	21.9	5.2
8	Ord.....	970.0	229.0
9	QM.....	181.0	42.9
10	Sig.....	191.0	45.0
11	Trans.....	21.6	5.0
12	Total II and IV.....	1,886.0	445.0

1	Item	Short tons per day	
		Per field army ¹	Per corps ²
12	Class III.....	2,350.0	555.0
13	Class V ³	2,630.0	620.0
14	Total.....	8,374.0	1,975.0

¹ Computed for field army of 3 corps, each corps composed of 3 infantry divisions and 1 armored division, and including necessary supporting and service elements (total strength 392,000).

² Computed for corps of 3 infantry divisions and 1 armored division, with necessary supporting and service elements (total strength 92,500).

³ Class V data applicable for periods of 14 days or more.

5-60. Airborne Division in Airborne Assault ^{1,2}

1	Item	Pounds per man per day	Short tons per division per day
2	Class I.....	6.60	34.89
3	Classes II and IV:		
4	Cml.....	0.00	0.00
5	Engr.....	1.00	5.29
6	Med.....	0.42	2.22
7	Ord.....	1.50	7.93
8	QM.....	1.00	5.29
9	Sig.....	1.04	5.50
10	Trans (avn) ³		
11	Total II and IV.....	4.96	26.23
12	Classes III and III (A):		
13	Class III ⁴	5.84	30.86
14	Class III (A) ⁵	4.63	24.50
15	Total III and III (A).....	10.47	55.36
16	Class V ⁶	86.06	454.93
17	Total abn div.....	108.09	571.41

¹ Based on combined strength of assault echelon and followup echelon (total 10,572) of TOE 57 plus augmentations and attachments as set forth in FM 57-100, appendix VI, section II.

² Nongas conditions; based on World War II data, modified to reflect new organizations and strengths. Changed tactical concepts may further modify these data.

³ Experience factors are not available.

⁴ Includes 5,000 gal per day for vehicles in objective areas.

⁵ Based on average of 4 hours' flying time per organic aircraft per day.

⁶ Computed as one-half of basic load.

5-61. Armored Division¹

1	2	3	4	5	6	7	8	9
Item	Attack		Pursuit and exploitation		Defense		Reserve	
	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per day tons per	Short tons per division per day	Pounds per man per day	Short tons per division per day
Class I.....	6.00	43.80	6.00	43.80	6.00	43.80	6.00	43.80
Classes II and IV:								
3 Cml.....	0.25	1.80	0.25	1.80	0.25	1.80	0.25	1.80
4 Engr.....	0.70	5.10	0.54	3.90	0.42	3.10	0.21	1.80
5 Med.....	0.30	2.20	0.30	2.20	0.15	1.10	0.15	1.10
6 Ord.....	² 14.10	103.00	2.14	15.60	2.00	14.60	³ 2.50	18.30
7 QM.....	2.11	15.40	2.11	15.40	2.11	15.40	³ 2.25	16.40
8 Sig.....	0.87	6.40	0.85	6.20	0.37	2.70	0.37	2.70
9 Trans.....	0.12	0.88	0.12	0.88	0.12	0.88	0.12	0.88
10 Total II and IV.....	18.45	134.78	6.31	45.98	5.42	39.58	5.85	42.98
11 Class III ⁴	13.80	101.00	23.30	170.00	7.51	55.00	5.83	43.00
12 Class V.....	50.00	365.00	8.80	64.00	53.20	387.00	(⁵)	-----
13 Total armd div.....	88.25	644.58	44.41	323.78	72.13	525.38	17.68	129.78

¹ Nongas conditions; based on World War II data, modified to reflect new organizations and strengths. Changed tactical concepts may further modify these data.

² Primarily battle losses of combat vehicles.

³ Increase over inactive situation because of intensified maintenance and replacement activities.

⁴ Does not include class III (A).

⁵ All elements of division out of combat.

5-62. Infantry Division¹a. Offensive Operations.²

1	2	3	4	5	6	7	8	9	10	11
Item	Attack of fortified position		Attack of deliberately organized position		Attack of hastily organized position		Pursuit		Assault of hostile shore	
	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day
Class I.....	6.000	46.81	6.000	46.81	6.000	46.81	6.000	46.81	6.900	53.84
Classes II and IV:										
3 Cml.....	0.251	1.95	0.252	1.96	0.051	0.39	0.091	0.71	0.191	1.49
4 Engr.....	2.130	11.12	0.843	6.73	1.260	9.83	0.979	7.63	1.170	9.13
5 Med.....	0.301	2.85	0.301	2.85	0.125	0.97	0.111	0.86	0.221	1.73
6 Ord.....	1.670	13.03	1.670	13.03	2.830	22.08	2.080	16.23	0.769	6.00
7 QM.....	0.942	7.35	0.929	7.25	0.938	7.31	0.659	5.14	0.502	3.41
8 Sig.....	0.959	7.43	0.991	7.73	0.961	7.49	0.710	5.54	0.389	3.03
9 Trans.....	0.110	0.95	0.110	0.95	0.110	0.95	0.110	0.95	0.110	0.95

	1	2	3	4	5	6	7	8	9	10	11
1	Item	Attack of fortified position		Attack of deliberately organized position		Attack of hastily organized position		Pursuit		Assault of hostile shore	
		Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day
10	Total II and IV	6.363	44.18	5.096	40.50	6.275	49.02	4.740	37.06	4.560	25.74
11	Class III ³	4.930	38.46	7.920	61.80	8.470	66.04	15.300	114.39	4.560	35.58
12	Class V	47.800	372.98	44.400	346.45	42.800	333.96	7.700	60.83	43.300	337.87
13	Total inf div	65.093	546.61	63.416	536.06	63.545	544.85	33.740	296.15	58.112	478.77

¹ Type Infantry Division agg. strength 15,606.

² Nongas warfare; based on World War II data, modified to reflect new organizations and strengths. Changed tactical concepts may further modify these data.

³ Does not include class III (A).

b. Defensive Operations.¹

	1	2	3	4	5	6	7	8	9
1	Item	Covering, security force, retirement or delaying action		Defense of Position		Inactive situation		Reserve	
		Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day
2	Class I	6.000	46.81	6.000	46.81	6.000	46.81	6.000	46.81
	Classes II and IV:								
3	Cml	0.361	2.81	0.361	2.81	0.251	1.95	0.251	1.95
4	Engr	0.811	6.32	1.460	11.39	0.501	3.90	0.159	1.24
5	Med	0.121	0.94	0.221	1.73	0.151	1.18	0.151	1.18
6	Ord	1.470	11.47	1.500	11.70	0.829	6.46	1.250	9.75
7	QM	1.320	10.30	1.100	8.58	2.110	16.46	2.110	16.46
8	Sig	0.721	5.62	0.989	7.71	0.479	3.73	0.479	3.73
9	Trans	0.110	0.95	0.110	0.95	0.110	0.95	0.110	0.95
10	Total II and IV	4.914	38.34	5.741	44.79	4.431	34.57	4.510	35.19
11	Class III ²	12.500	97.87	6.830	53.29	6.410	50.01	2.230	17.40
12	Class V	26.100	203.65	50.000	390.15	16.200	126.40	-----	-----
13	Total inf div	49.514	425.08	68.571	579.91	33.041	292.42	12.740	124.66

¹ Nongas warfare; based on World War II data, modified to reflect new organizations and strengths. Changed tactical concepts may further modify these data.

² Does not include class III (A).

Section VIII. PROCUREMENT

5-63. Procurement (fig. 5-8)

a. Procurement Operations. Subsequent to World War II, the U.S. Army has been called upon to provide logistical support for Allied forces throughout the world in addition to fulfilling its own requirements. "Offshore" procurement agencies have been established in Europe, the Middle East, and the Far East to supplement supplies which must be obtained from CONUS. Officers assigned to MAAG-type units may estimate the personnel required in a procurement section for the supplementary

support of Allied forces by use of figure 5-8, which is applicable to all types of supplies:

b. Procurement Leadtime. Procurement leadtime may vary from 2 to 24 months. Because of the many variables involved, it is not possible to obtain an average estimate of leadtime with any degree of accuracy. Some of the factors affecting leadtime are type of item, quantity to be procured, status of production base, and tooling involved. The appropriate USAMC commodity command should be consulted on an item-by-item basis when a close estimate of leadtime is required.

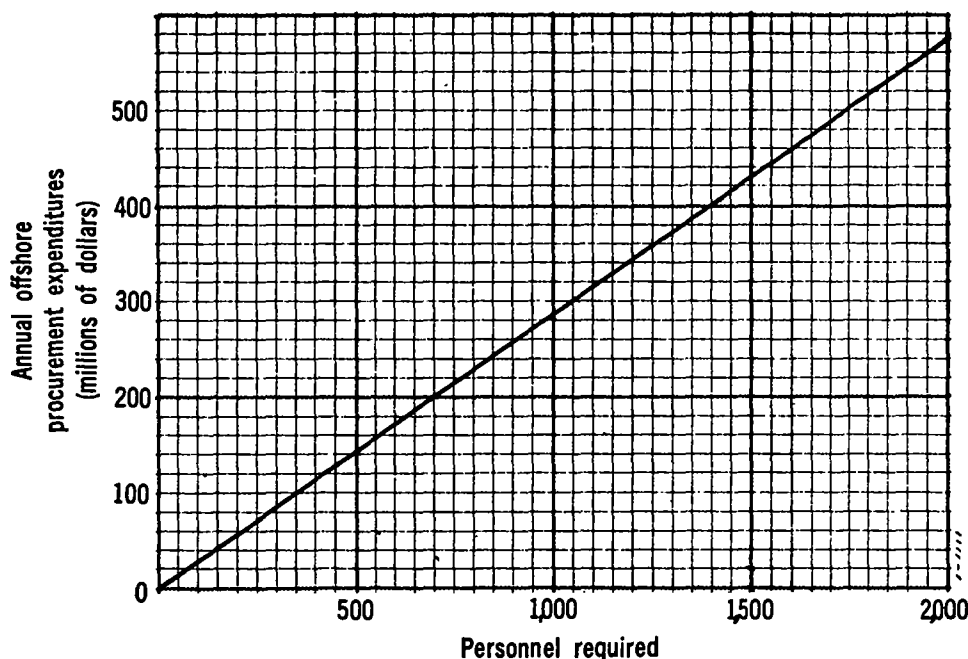


Figure 5-8

Section IX. STORAGE

5-64. Definition of Terms

An understanding of the following terms is necessary to be able to use the data listed in this section in determining storage area requirements.

a. Storage Space. Any space, without regard to type of construction or improvement, used for storage.

b. Storage Building. Any building constructed or acquired for the storage of supplies, even though some part of it has been diverted to and is used for office, depot utility storage, or repair shops. Buildings constructed or acquired for office buildings, repair shops, depot utility storage buildings, except when they are used in whole or in part for the storage of supplies, are not considered storage buildings.

The actual area used for storage purposes within such a building is considered storage space for reporting purposes.

- (1) *Warehouse space.* Area in a building designed for storage purposes and constructed with roof and complete side and end walls.
- (2) *Heated space.* Area in which the temperature may be controlled within specified limits by the application of heat.
- (3) *Unheated space.* Area not equipped with heating facilities.
- (4) *Humidity controlled space.* Warehouse area equipped with humidity control equipment.
- (5) *Flammable space.* Warehouse area which has been designed for the storage of highly flammable material.
- (6) *Shed space.* Area in a building without complete side and end walls.
- (7) *Other space.* Any area assigned for storage operations, within a structure designed for other than storage purposes. Dry tank space is included.

c. Gross Space. The entire inside area of covered storage space, determined by using inside dimensions of building; the overall area of open storage space with no deductions for trackage and permanent roads; the actual space (pads) for ammunition and toxic open space.

d. Bin Storage. Storage of parts, subassemblies, assemblies, or end items in bins so that an item may be withdrawn without breaking open a package containing a number of such items.

e. Aisle in Storage Space. Area designated for passageway within the storage area.

f. Receiving and Shipping Space. Gross space designated as work area for receipt and shipment of supplies and equipment.

g. Nonstorage Space. That area within gross space which is not used for storage because of structural losses or designation for other than storage purposes. Includes transit shed space when used or reserved for that purpose.

h. Net Storage Space. The floor area upon

which bins are erected plus the floor areas upon which material can be stored.

i. Net Usable General Storage Space. That portion of total gross space on which supplies can actually be stored. It does not include bin storage space, aisles, or receiving and shipping space.

j. Open Space. Improved or unimproved area designated for use in storing material.

k. Open Improved Storage Space. Open area which has been graded and hard surfaced or prepared with topping of some suitable material to permit effective materials handling operations.

l. Open Unimproved Wet Space. That water area specifically allotted to and usable for the storage of floating equipment.

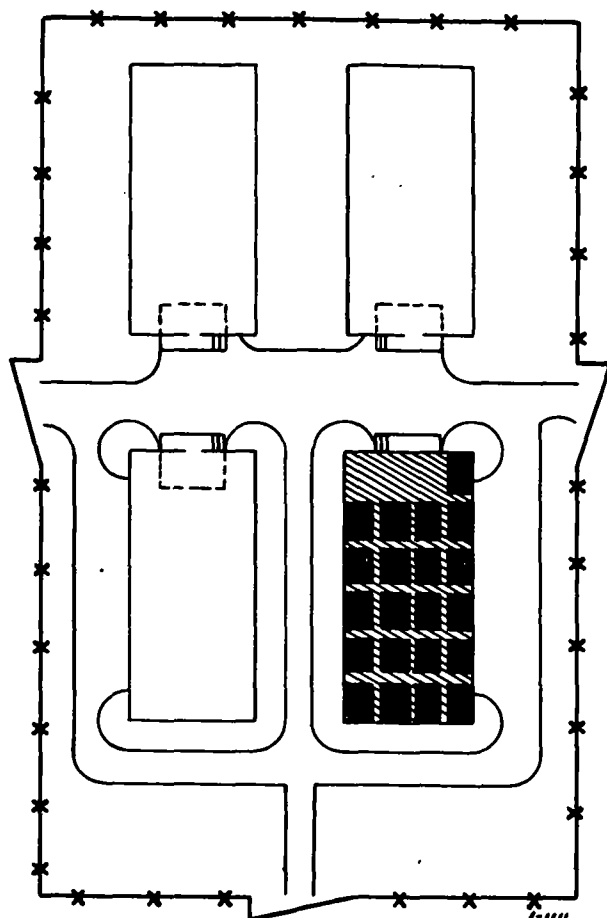
m. Magazine (Including "Igloo"). Storage structures above or below ground, constructed for the storage of ammunition and explosives. These structures will be reported as magazines regardless of whether ammunition and explosives are actually stored in them. The only circumstances under which magazines will be reported under warehouse space are when the magazine has been designated as "flammable material space" in accordance with definition in *b*(5) above. Conversely, warehouses containing ammunition will not be reported as magazines. Occupancy of magazine will be computed to include that area utilized as access aisle space contiguous to materials stored. The remainder unoccupied will be reported as vacant.

n. Tank Storage Space. Space in tank designated for the storage of supplies other than bulk liquids.

o. Ammunition and Toxic Open Space. Area especially prepared for storage of explosive ammunition and toxic materiel. For reporting purposes, it does not include the surrounding area restricted for storage because of safety-distance factors. It includes barricades and improvised coverings.

p. Cold Storage Warehouse. Space in which a controlled temperature below 50°F., may be maintained.

(1) *Chill space.* Refrigerated warehouse



LEGEND

■ = Net usable storage area.

■ + ▨ = Gross space (in covered storage, this equals the total floor space of the buildings).

■ + ▨ + [x x x] = Site area.

Figure 5-9

area in which the temperature can be controlled between 32°F. and 50°F.

- (2) *Freeze space.* Refrigerated warehouse area in which the temperature can be controlled below a level of 32°F.

q. Allocated Space. That area designated by higher authority representing the gross area formally apportioned for use. Space formally apportioned to the using administrative and logistical services by the Deputy Chief of Staff for Logistics, Department of the Army.

r. Dispersed Storage Areas. Those portions of a depot or subinstallation that are geograph-

ically located away from the main establishment, but not at another reporting installation.

s. Subinstallation. Those establishment so designated by Department of the Army directives.

t. Site Area.

- (1) Site area, in covered storage, is the total land area required for buildings, spaced at minimum distances, plus all the necessary operating areas, such as access roads, depot roads, railway sidings, and truck parks.
- (2) Site area, in open storage, is the total

land surface required for net usable general storage area as defined above, plus that additional area required to fulfill safety regulations and to properly operate the storage facility as a whole.

u. Gross Space Factor. The ratio of the gross space to the net usable general storage area. After the net usable general storage area requirement, as described above, has been determined, the gross space requirement is obtained by multiplying the net usable general storage area value by the pertinent gross space factor, as follows:

$$\text{Gross space} = \text{Net usable general storage area} \times \text{Gross space factor}$$

v. Site Area Factor. The ratio of the site area

to gross space. These figures can be determined by the use of gross space and site area factors shown on chart, paragraph 5-68. Having determined the gross space requirements, the site area requirement is obtained by multiplying the gross space value by the pertinent site area factor as follows:

$$\text{Site area} = \text{Gross space} \times \text{Site area factor.}$$

w. Illustrating Diagram (fig. 5-9).

5-65. Storage Factors

a. The following table gives optimum storage tonnage area requirements for support of military operations. These data are for general planning purposes only and may vary greatly as a result of climate condition or the tactical situation. For detail data pertaining to storage planning, see TM 743-200.

1	Class	2 Consumed per man in theater, Army plus AF, short tons/man/month	3 Percentage of tons of supplies stored		5 Tons/man/month of supplies stored		7 Gross space/man month of supply	
			Covered	Open	Covered (short tons)	Open (short tons)	Covered (sq ft)	Open (sq ft)
2	I.....	0.1005	60	40	0.0603	0.0402	0.910	0.803
3	II, IV, II (A), and IV (A):		(Storage provided in air depot)					
4	Air Force (II (A) and IV (A) less aircraft).	0.0390						
5	Chemical.....	0.0009	70	30	0.0006	0.0003	0.011	0.009
6	Engineer:							
7	Less construction.....	0.0095	20	80	0.0019	0.0076	0.023	0.152
8	Construction.....	0.1092	10	90	0.0109	0.0983	0.125	1.875
9	Medical.....	0.0045	90	10	0.0040	0.0005	0.080	0.012
10	Ordnance:							
11	Less vehicles.....	0.0407	20	80	0.0081	0.0326	0.120	0.644
12	Vehicles.....	0.0102	0	100	0.0000	0.0102	0.000	0.276
13	Vehicle parts.....	0.0077	40	60	0.0031	0.0046	0.048	0.124
14	Quartermaster:							
15	Sales items.....	0.0110	90	10	0.0099	0.0011	0.133	0.030
16	Less sales.....	0.0041	90	10	0.0037	0.0004	0.050	0.011
17	Signal.....	0.0110	70	30	0.0077	0.0033	0.210	0.045
18	Transportation.....	0.0020	5	95	0.0001	0.0019	0.001	0.034
19	III and III (A):							
20	Bulk POL (avn).....	0.1380	(Tank farm)					
21	Bulk POL.....	0.1455	(Tank farm)					
22	Solid fuel.....	0.1320	0	100	0.0000	0.1320	0.000	2.640
23	Packaged POL.....	0.0135	10	90	0.0014	0.0121	0.021	0.327
24	V and V (A):							
25	V (including 10 percent of V (A)) ¹	0.1304	10	90	0.0130	0.1174	0.195	2.350
26	V (A).....	0.0527	(Storage provided in air depot)					
27	Total.....	0.9624			² 0.1203	² 0.4669	² 1.762	² 9.763
28	I, II, III (packaged), and IV.....	0.3248	33	67	0.1073	0.2175	1.567	4.763
29	III solid fuels.....	0.1320	0	100	0.0000	0.1320	0.000	2.640
30	V.....	0.1304	10	90	0.0130	0.1174	0.195	2.350

¹ Army supporting Air Force will store small arms ammunition which is estimated to be 10 percent of total.

² Does not include storage in air depots and tank farms.

b. Average ratios of gross space open to covered, by classes of supply are as follows:

	Ratios of gross space open to covered	
All classes (except bulk POL) -----	5.5	1
Classes I, II, III (packaged and solid), and IV.	4.7	1
Classes I, II, III (packaged), and IV----	3.0	1
Class V (including 10 percent of V (A))--	12.0	1

c. For classified data pertaining to storage of hazardous materials, see FM 101-10-3, chapter 5.

5-66. Storage Space Conversion Factors

The following table indicates the net usable general storage area (sq ft) occupied per short ton:

	1	2	3	5	4
1	Branch	Type of storage			
		Covered storage	Open storage	Igloo and magazine	Open storage ammunition
2	Adjutant General's Corps.	10.0			
3	Army Medical Service.	13.0	16.0		
4	Chemical Corps ---	12.5	20.8	7.0	11.0
5	Corps of Engineers--	8.0	13.0		
6	Ordnance Corps --	10.0	18.0	7.0	11.0
7	Quartermaster Corps.	9.0	17.1		
8	Signal Corps -----	10.0	16.0		
9	Transportation Corps.	7.0	12.0		

5-67. Average Stack Heights*

a. Covered Storage. All services -----8 ft.

b. Open Storage. All services -----6 ft.

5-68. Guns Space and Site Area Factors

	1	2	3	4	5	6
1	Class of supply	Services	Gross space factors ¹		Site area factors ²	
			Covered	Open	Covered	Open
2	I-----	Quartermaster-----	1.40	1.50	2.00	1.50
3	II-----	All services -----	1.25	1.30	1.80	1.43
4		Ordnance -----	2.00	2.00	3.00	3.00
5		Quartermaster-----	1.40	1.50	2.00	1.50
6	III ³ -----	Signal -----	2.00	2.20	1.80	1.43
7		Quartermaster-----	1.25	1.30	1.80	1.43
8	IV-----	All services -----	1.25	1.30	1.80	1.43
9		Ordnance -----	2.00	2.00	3.00	3.00
10		Quartermaster-----	1.40	1.50	2.00	1.50
11		Signal -----	2.00	2.20	---	---
12	V-----	Ordnance and Chemical -----	1.25	1.25	⁴ 112.00	(⁵)

¹ Apply additional factor of 3 for storage in combat zone.

² Apply additional factor of 5 for storage of classes I, II, III, and IV in the combat zone.

³ Excludes bulk storage of petroleum in tanks.

⁴ These factors take into consideration the great amount of dispersion necessary as a safety precaution in storing ammunition.

⁵ See paragraph 5-67.

* Figures given are for use in theaters. For CONUS storage, increase by 25 percent.

5-69. Operating Personnel Required For all Storage Within a Theater †

(fig. 5-10)

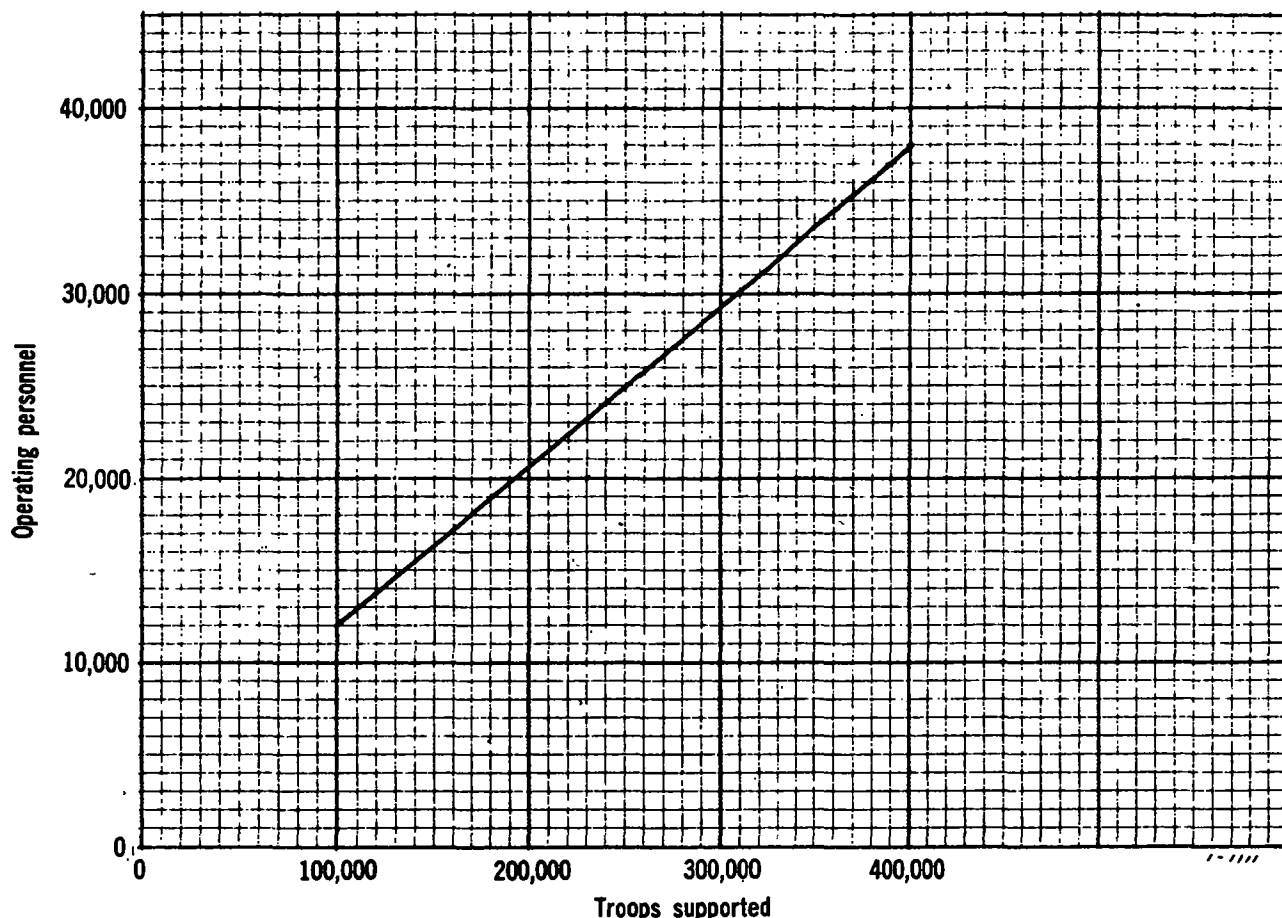


Figure 5-10

† May include prisoners of war and civilians as available.

5-70. Miscellaneous Factors ¹

Ammunition storage per mile of road. ²	1,000 short tons.
Ammunition storage per square mile. ²	5,000 short tons.
Minimum hardstanding requirements for 2,500 vehicles. ³	110,000 sq ft.
Solid footing for vehicle park for 2,500 vehicles.	4,000,000 sq ft.
Minimum hardstanding requirement for artillery and combat vehicles, per item.	350 sq ft.

¹ Reference: ORD M 7-224.

² Refers to temporary storage of ammunition along roadways and in urban fields and forest, such as may be found in combat zones.

³ Data based on the assumption that hardstanding area will not be required for the total number of vehicles at any one time.

5-71. Handling of Supplies

a. Labor Requirements.

- (1) *Hand operations.* For long-term planning purposes, labor requirements for handling supplies by hand are computed on the average of $\frac{1}{2}$ ton per man per hour for 10 hours each day. For short periods, the average is much higher.
- (2) *Mechanical handling.* For planning purposes, the labor requirements for handling supplies by use of mechanical equipment, such as forklift trucks and tractor-trailer trains, are normally limited to a working foreman

and equipment operators to operate the mechanical equipment necessary to efficiently handle these supplies.

b. Handling Crews.

(1) *Hand operations.* The maximum number of men that may be employed advantageously in loading or unloading one freight car is nine (one working foreman and eight laborers). The maximum crew for loading or unloading average loads by hand on Army trucks is five men (one working foreman and four laborers).

(2) *Mechanical handling of palletized loads.* The maximum number of men required to advantageously load or unload one freight car or truck of palletized supplies using mechanical handling equipment is three (one working foreman and two materials handling equipment operators).

c. Time Estimate (based on manual handling). The time estimate for average packaged or bundled military loads¹ at depots, supply

points, or using units, under average conditions, a five-man crew for each truck or trailer, and the number of trucks or trailers to be loaded or unloaded simultaneously, dependent on amount of labor available, is as follows:

Loading and unloading	2½-ton truck	2½-ton trailer
Average time -----	50 min	20 min
Minimum time -----	30 min	12 min

¹ See chapter 7 regarding authorized 100 percent overload for certain vehicles under some conditions and double time estimates when necessary.

5-72. Materials Handling Equipment Requirements (fig. 5-11)

A depot supply 100,000 men will require approximately 7,700 measurement tons of materials handling equipment, including conveyors, pallets, scales, tractors, trailers, forklift trucks, handtrucks, lumber-straddle trucks, stock-picker trucks, etc.

5-73. Illustrative Problems

a. Situation, Problem A. To determine storage requirements for a theater of operations requiring 100,000 measurement tons of class I supplies.

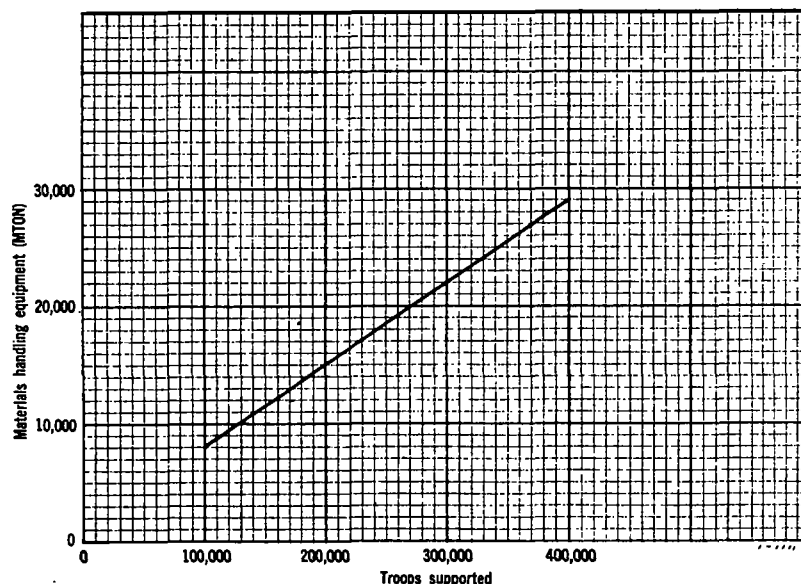


Figure 5-11

b. *Solution, Problem A.* Storage area requirements:

A measurement ton (MTON) = 40 cu ft.

Therefore, $100,000 \text{ MTON} \times 40 = 4,000,000$ cu ft of supplies to be stored.

Minimum percentage of covered storage required is 60 percent (see para 5-65).

Therefore, 40 percent open storage required.

$0.60 \times 4,000,000 \text{ cu ft} = 2,400,000 \text{ cu ft}$ of supplies required covered storage.

$0.40 \times 4,000,000 \text{ cu ft} = 1,600,000 \text{ cu ft}$ of supplies to be stored in the open.

Average stack heights (see para 5-67):

Covered storage = 8 feet.

Open storage = 6 feet.

$2,400,000 \text{ cu ft} \div 8 \text{ ft} = 300,000 \text{ sq ft}$, net usable area of covered storage required.

$1,600,000 \text{ cu ft} \div 6 \text{ ft} = 267,000 \text{ sq ft}$, net usable area of open storage required.

Gross space for each type of storage is based on net usable general storage areas. Factors for computations, as found in paragraph 5-68, are—

Covered storage = 1.4

Open storage = 1.5

(Assume storage is to be in communications zone; hence, additional combat zone factor of 3 is not required.)

$300,000 \text{ sq ft} \times 1.4 = 420,000 \text{ sq ft}$, gross space required for covered storage.

$267,000 \text{ sq ft} \times 1.5 = 400,500 \text{ sq ft}$, gross space for open storage.

Site areas for each type of storage are based on gross . Factors for computations are found in paragraph 5-68.

Covered storage = 2.0

Open storage = 1.5

(Assume storage is to be in communica-

tions zone; hence, additional combat zone factor of 5 is not required.)

$420,000 \text{ sq ft} \times 2.0 = 840,000 \text{ sq ft}$, site area required for covered storage.

$400,500 \text{ sq ft} \times 1.5 = 600,750 \text{ sq ft}$, site area required for open storage.

Total site area required:

Covered storage = 840,000 sq ft

Open storage = 600,750 sq ft

1,440,750 sq ft

$1,440,750 \text{ sq ft} \div 43,560 \text{ sq ft (1 acre)} = 30.7$ or 31 acres of site area required.

c. *Situation, Problem B.* To determine operating personnel and materials handling equipment requirements for all storage in a theater which has a strength of 250,000 men.

d. *Solution, Problem B.*

- (1) *Part I, operating personnel requirements.* (See fig 5-10, para 5-69.) On the horizontal scale of this figure locate the vertical line representing 250,000 men. This line crosses the oblique graph line at the horizontal line representing 24,500 operating personnel, as indicated on the left margin. Therefore, for general planning purposes, 24,500 men are needed to operate theater depots.
- (2) *Part II, materials handling equipment requirements.* Using the same assumption for theater strength as used in part I above, the figure 5-11 in paragraph 5-72 shows that for 250,000 men, 18,500 measurement tons of materials handling equipment will be required.

5-74. Characteristics of Materials Handling Equipment

	1	2	3	4	5	6	7	8	9	10	11	12
1	Item ¹	Dimensions			Weight (lb)		Displacement (cu ft)	Capacity		Type of tires ² (S-solid rubber) (P-pneu- matic)	Method of operation	Primary use
		Length (in)	Width (in)	Height (in) (mini- mum)	Operating	Shipping		Load (lb)	Height			
2	Trucks, forklift.....	69	35	83	4,480		119	2,000	10' 10"	S	Gasoline	Useful in moving and stacking palletized loads. Not efficient to move supplies over horizontal distances greater than 250 ft.
3	-----	65	35	83	3,700		166	2,000	10' 10"	S	Electric	
4	-----	76	41	83	5,876		150	3,000	9' 0"	S	Gasoline	
5	-----	115	79	107	7,035		570	3,500	12' 0"	P	Gasoline	
6	-----	78	41	91	6,870	7,130	174	4,000	12' 0"	S	Gasoline	
7	-----	76	41	102	6,186		184	4,000	12' 0"	S	Gasoline	
8	-----	105	45	95	7,660		260	4,000	12' 0"	P	Gasoline	
9	-----	118	33	83	5,714	6,470	153	4,000	10' 10"	S	Electric	
10	-----	77	41	91	5,920	6,300	146	4,000	12' 0"	S	Electric	
11	-----	113	68	115	10,375	10,800	528	6,000	14' 0"	P	Gasoline	
12	-----	94	42	92	9,200		210	6,000	10' 7"	S	Gasoline	
13	-----	94	42	113	9,400		258	6,000	14' 0"	S	Gasoline	
14	-----	84	43	102	10,155		212	6,000	14' 0"	S	Electric	
15	-----	136	77	150	14,145		976	10,000	17' 6"	P	Gasoline	
16	-----	152	96	150	18,330		1,267	15,000	17' 6"	P	Gasoline	
17	Trucks, forklift, rough terrain.	243	90	124	16,850		1,550	6,000	12' 0"	P	Gasoline	
18	-----	276	102	131	26,580	24,000	2,131	10,000	12' 0"	P	Gasoline	Transfer of cargo on unimproved surfaces. Most common usage, beach operations. Primarily for transporting unit loads short distances. May be used for stacking. Less expensive than forklift trucks, but less maneuverable.
19	Trucks, platform.....	86	31					4,000	0' 4"		Electric	
								Drawbar pull (lb)				
20	Tractors, warehouse.....	87	41	64	2,900	2,910	134	2,000		S	Electric	Used for drag towing on skids or towing one or more trailers. Tractor is small and maneuverable; should be used for moving when distance exceeds 250 ft.
21	-----	93	42	62	3,260	3,260	144	2,600		P	Gasoline	
22	-----	111	66	57	5,220		252	4,000		P	Gasoline	
23	-----	116	66	62	5,800	5,870	277	4,000		P	Gasoline	
24	-----	86	42	59	3,500	3,650	131	4,000		S	Electric	
25	-----	130	96	72	9,500		520	7,500		P	Gasoline	
								Load (lb)				

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Item ¹	Dimensions			Weight (lb)		Displacement (cu ft)	Capacity		Type of tires ² (S-solid rubber) (P-pneumatic)	Method of operation	Primary use
		Length (in)	Width (in)	Height (in) (minimum)	Operating	Shipping		Load (lb)	Height			
26	Cranes, wheeled, swinging boom.	139	63	72	12,855	-----	365	6,000		S	Electric	Handles loads of shapes and size which are moved with difficulty by other equipment.
27	-----	295	94	95	20,800	20,800	1,525	10,000		P	Gasoline	
23	-----	273	96	260	20,000	20,320	1,441	10,000		P	Gasoline	
29	Trucks, straddle-----	192	96	159	14,800	16,500	1,733	30,000		P	Gasoline	Used extensively for moving lumber, poles, pipe, rods, and girders.

¹ All items of materials handling equipment not listed here. Typical items of varying capacities are listed. For more complete information, see TM 10-1619.

² Solid rubber-tired vehicles are used for hardstand; pneumatic-tired for unimproved terrain.

Section X. DISTRIBUTION

5-75. Normal Order and Shipping Times

The following table illustrates the time required to process normal bulk shipment of supplies. Times shown are for illustrative purposes only and represent an average of the probable maximum time intervals for processing a wide variety of items under varying conditions. Such intervals will increase or decrease depending on the length and complexity of the requisition, the class of supply, the distance of the theater from CONUS, availability of transport, the type of transportation and handling facilities employed, workload on the various installations, and other factors.

Maximum Oversea Order and Shipping Time Allowance for Troop Support Requisitions

Area		A	B	C	A	B	C	A	B	C	A	B	C	Responsible agency
Issue group		1			2			3			4*			
Priority designators		1 through 3			4 through 8			9 through 15			16 through 20			
Emphasis required		7-day work week 24-hour work-day—issue stocks to "0" balance			7-day workweek 24-hour work-day—issue stocks to "0" balance			Regular workweek regular shift workday—issue to control level.			Regular workweek regular shift workday—issue to control level.			
Cycle segments		Consecutive hours			Calendar days			Calendar days			Calendar days			
1.	From transmittal of requisitions by oversea command to receipt by initial source of supply.	0	0	0	0	0	0	1	1	1	1	1	1	Oversea command
2.	From receipt of requisition by initial source of supply until supplies are released to carrier. <i>Note. This time is divided as follows:</i>	24	24	24	3	3	3	10	10	10	12	12	12	Initial source and shipping activities.
	Stock control activity.....	(8)	(8)	(8)	(1)	(1)	(1)	(3)	(3)	(3)	(4)	(4)	(4)	Initial source Shipping activity. Transportation agency.
	Shipping activity.....	(16)	(16)	(16)	(2)	(2)	(2)	(7)	(7)	(7)	(8)	(8)	(8)	
3.	From date supplies are turned over to carrier until receipt at oversea terminal.	88	88	88	8	8	8	28	28	28	37	37	52	
	Time depot to terminal.....	(24)	(24)	(24)	(2)	(2)	(2)	(5)	(5)	(5)	(9)	(9)	(9)	Oversea command
	Time in terminal.....	(12)	(12)	(12)	(2)	(2)	(2)	(5)	(5)	(5)	(10)	(10)	(10)	
	Time in transit (air or sea)...	(52)	(52)	(52)	(4)	(4)	(4)	(18)	(18)	(18)	(18)	(18)	(33)	
4.	From receipt at oversea terminal to recorded receipt by requisitioner.	56	56	56	4	4	4	11	6	6	15	10	10	
	Time in discharge.....	(24)	(24)	(24)	(2)	(2)	(2)	(3)	(3)	(3)	(7)	(7)	(7)	
	Terminal intratheatre movement and recording in requisitioners records.	(32)	(32)	(32)	(2)	(2)	(2)	(8)	(3)	(3)	(8)	(3)	(3)	
	Total.....	168 hours			15 days			50	45	55	65	60	75	

Note. When not otherwise reflected, transmission times are charged to the sender.

AREA A: Europe

AREA B: Alaska, Bermuda, Caribbean, Hawaii, and South America

AREA C: All other oversea areas

* See paragraph 2-13d, AR 725-50, for instructions on the assignment of required delivery date beyond the normal order and shipping time (issue group 4).

5-76. Army Repair Parts Supply System

The Army supply system is based on selective stockage, single-line item requisitions, and electronic transmission and processing of supply data. Requisitions are processed through field army and theater army logistical command to CONUS supply sources by means of high-speed data transmission equipment (transceivers). When coupled with centralized stock control, high-speed data processing equipment, and direct delivery of theater nonstocked items to forward supply points, the system offers substantial reduction in order and shipping times.

5-77. Buildup of Supply Levels

(fig. 5-12)

a. For estimation of requirements when it is desired to build up a certain level of supplies by a given date, at the same time adequately supplying present and future contemplated operations during the buildup period, the following formula is useful:

$$S = C \left(1 + \frac{L}{T} + W \right)$$

when—

S = *shipping requirements* during the buildup phase, expressed in pounds per day.

C = *consumption* (average) in pounds per day.

W = *a wastage factor* (percentage of total consumption expressed as a decimal). This factor is based on experience in the particular theater and normally ranges from 0 to 0.25.

L = *the supply level to be attained*, expressed in days of supply.

T = *time length of buildup phase* in days.
(Given any four of the factors, the fifth can be determined by transposing.)

b. Since the formula in *a* above assumes a constant troop strength, a chart similar to the following (fig. 5-12) may be used to show the relation between changes in troop strength, the cumulative consumption, and cumulative receipts in the establishment of a specified level of supply during a given buildup period.

5-78. Lines of Communications Buildup Capacity

(fig. 5-13)

a. *General.*

- (1) The preceding chart indicates the maximum cumulative strength which can be built up in the shortest time, using lines of communications of fixed capacity, if these lines of communications also carry replenishment loads for personnel previously transmitted.
- (2) The chart is applicable to situations in which maintenance loads are directly proportional to loads previously carried (initial loads) and has been prepared for the values 2, 4, 6, and 10 of R (ratio of initial to maintenance loads). Additional lines can be added readily to the chart for additional values of R .

- (3) For each value of R , two lines are shown on the chart—one solid and one dashed. For each value of R , use of the solid or dashed line in computations depends on the assumption applicable to the situation.

- (a) The solid-line curve in each case is based on the assumption that at any time T , the strength being served on a maintenance basis, is equal to the accumulation of strength previously served on an initial basis (that is, maintenance begins immediately upon passage, and initial loads are not alternately depleted and replenished).

- (b) The dashed-line curve in each case is based on the assumption that the increment of strength served on an initial basis in any 1 month will be served on a maintenance basis during the following month (that is, initial loads would be depleted, on the average, by approximately 15 days' maintenance supply before replenishment would begin).

b. *Construction of Curves for Additional Values of R .* To construct curves for values of R , other than those shown, proceed as follows:

- (1) For solid lines (see assumption in *a*(3), above), draw a straight line

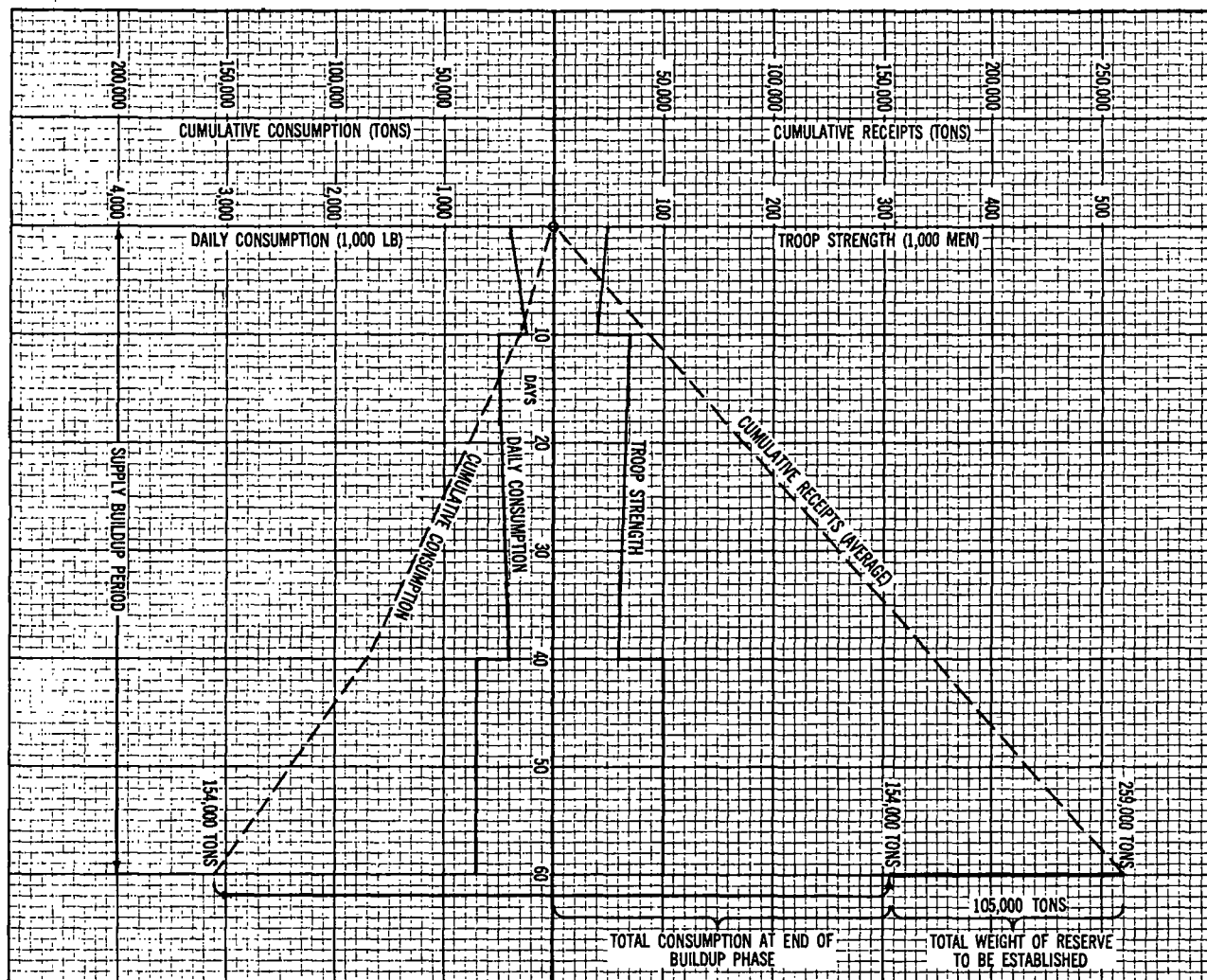


Figure 5-12

through the origin (0, 0) and the point on scale *R* representing the value of *R* (ratio initial/maintenance loads).

- (2) For dashed lines (see assumption in a(3), above), draw a straight line through the origin (0, 0) and the

point on scale *R* which is less by 0.5 than the value of *R*.

c. *Examples of Use of Chart* (fig. 5-13). This chart may be used in calculations relating to the movement of troops or supplies through a terminal or, analogously, to their movement over any available lines of communications—for example, a railroad, a highway, an air trans-

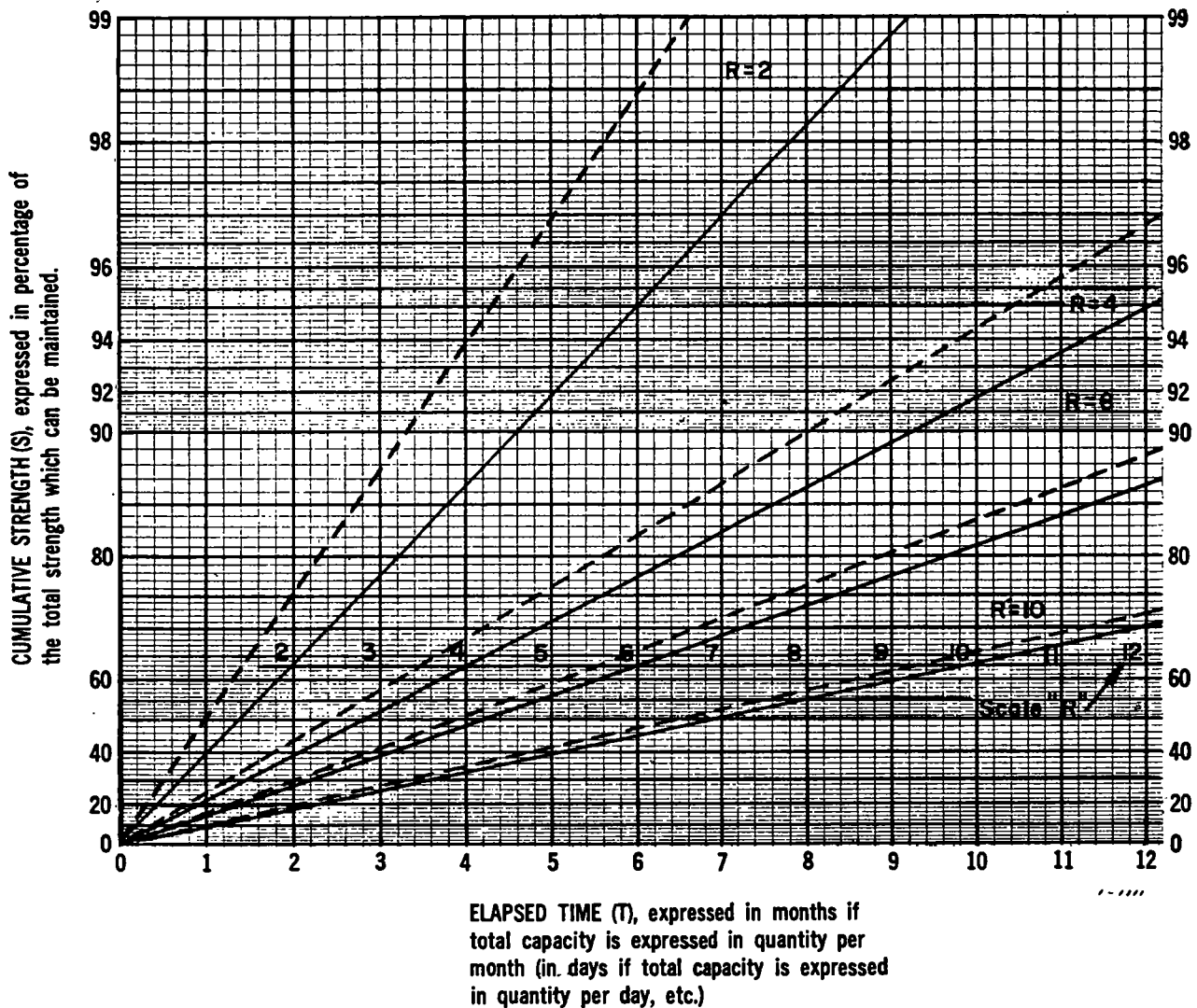


Figure 5-13

port route. It can be used to determine the time it would take to reach various strengths, the strength which can be accumulated in any amount of time, and the necessary shiploads of initial or maintenance supplies. The ratio R may be based on space requirements; number of cars, ships, tonnages; number of individuals; etc.

(1) *Example 1.*

(a) *Problem.* The capacity of a port = 300,000 MTON/month. Initial equipment for troops moving through the port = 4.8 MTON/man; supplies for maintenance of

troops moved through the port = 0.8 MTON/man/month. What strength can be built up through this port in 7 months if maintenance supply for the troops begins immediately with their passage?

(b) *Solution.*

1. $R = \text{initial} \div \text{maintenance load} = 4.8 \div 0.8 = 6.$
2. $T = \text{time elapsed} = 7 \text{ months}.$
3. From the chart, locate $T = 7$ on the horizontal scale, and continuing vertically upward to the intersection of $T = 7$ with the solid line for R

- = 6, read "Cumulative Strength (S)" from the vertical scale = 69 percent of the total strength which can be maintained.
4. Total strength which can be maintained = $300,000 \div 0.8 = 375,000$ troops.
 5. Therefore, cumulative strength after 7 months = 69 percent of 375,000 = 259,000 troops.

(2) *Example 2.*

(a) *Problem.* Assuming the same circumstances in example 1, above, how many new troops will be moved through the port during the 7th month?

(b) *Solution.*

1. Proceed as in the solution to example 1, above, except determine the cumulative strength after 6 months = 64 percent of the total strength which can be maintained.
2. From the solution to example 1 and the foregoing, it is observed that from the end of the 6th to the end of the 7th month (that is, during the 7th month), the cumulative strength changed from 64 percent to 69 percent of the total strength which could be maintained.
3. Therefore, the new troops moved in during the 7th month represent 69 less 64 percent = 5 percent of the total strength which can be maintained = 5 percent of 375,000 = 18,750 troops.

(3) *Example 3.*

(a) *Problem.* Assuming the circumstances as in example 1, above, except that the maintenance factor of 0.8 MTON/man/month is so established that maintenance can start during the following month for all troops moved initially during any 1 month, what could be the strength built up after 7 months?

(b) *Solution.*

1. Proceed as in the solution to example 1, above, except that in using the chart, use the *dashed* line for

$R = 6$ rather than the solid line.

2. Read cumulative strength = 72 percent of the total strength which can be maintained.
3. Cumulative strength after 7 months = 72 percent of 375,000 = 270,000 troops.

(4) *Example 4.*

(a) *Problem.* Initial and maintenance supplies for service forces are to be moved over a highway, the capacity of which is 10,000 short tons per month. Initial equipment for these forces averages 3,350 pounds per man; maintenance averages 430 pounds per man per month. When will the size of the service force have been built up to 60 percent of its ultimate strength, if maintenance supply must begin immediately upon passage of the forces?

(b) *Solution.*

1. $S = 60$ percent of the maximum which can be supported.
2. $R = 3,350 \div 430 = 7.8$.
3. Inasmuch as no line for $R = 7.8$ appears on the chart, it must be constructed. Observing the assumption in the problem above as to initiation of maintenance, draw a solid line through (0, 0) and the point 7.8 on scale R (in accordance with directions above).
4. Using the constructed line, as indicated in previous examples, determine for $S = 60$ percent that $T = 7$ months.

5-79. Combat Zone Supply Installations

a. *General.*

- (1) Listed in the following chart are the field army supply installations usually found within the combat zone, showing in detail the class of supply and the normal supply installations for each class of supply. For each class of supply, the following are shown: the depots found in the field army service area; the supply points required to support the corps; and the normal pro-

cedure by which divisions or similar using units draw the specific classes of supply.

- (2) The supply system within the field army must be simple and, above all, flexible to meet changing situations. Mission, terrain, weather, road, and rail nets affect selection of locations for supply installations.

- (a) On the offensive, the supply points are well forward and contain at least 2 to 3 days of supply for the unit or units being served. As a general rule, two class I, class III, and class V supply points support each corps, located well forward in the area but out of heavy artillery range. Engineer class II and IV supply points might also be established if the conditions of roads and bridges require large quantities of construction materials. In addition to the medical depots, there normally will be three advance medical supply points, each supporting forward evacuation hospitals and divisions.

- (b) On the defensive, the engineer class II and IV supply points will be located well forward, containing fortification materials. The other supply points will be located farther to the rear and normally will carry a 3-day level for the troops supported.
 - (c) Normally, transportation Army aircraft maintenance and supply companies will be located in the vicinity of an airstrip.
- (3) Supply points serve all units in the area. (If field army troops are located near a supply point, then that supply point will serve those units.) All field army supply points are operated by field army troops. All supply installations located in the corps or division area are cleared for area locations by corps or division before they are established.
 - (4) The tables show the type of supply installations needed to support a field army under normal conditions. Ground reconnaissance is the only method for selecting sites for installations.

b. Installations

	1	2	3	4
1	Item	Field army service area	Corps area	Unit supply procedure ¹
2	Chemical classes II and IV.	1. Installation: chemical class II, IV, and V depot. 2. In addition to chemical class II and IV items, the depot stores and issues class V items. 3. Two such depots normally established in field army service area. 4. Wholesale issue to class II and IV supply points; retail to field army troops. 5. May be operated by one or more chemical depot companies or by one or more chemical general support companies. 6. Levels for classes II and IV established by theater; will normally be 5 to 15 days.² 7. Covered storage for classes II and IV required—approximately 80 percent. 8. Maintenance may be furnished in or adjacent to depot for chemical materiel by chemical maintenance companies or by chemical maintenance platoons of chemical general support companies.	1. Installation: chemical class II and IV supply point. 2. Normally two supply points per corps operated by chemical depot company or by chemical general support company. 3. Normally retail issue. 4. Levels established by field army. 5. Covered storage required—approximately 50 percent. 6. Maintenance is furnished by supply and maintenance section of direct support platoon of chemical direct support company or by maintenance platoon of chemical general support company.	1. Units of the division normally forward requirements to supply and transport battalion; chemical items will be distributed through the supply and transport battalion. When a chemical direct support platoon is attached, requirements will be forwarded to the platoon; chemical items will be distributed through the platoon. 2. When attached, the chemical direct support platoon will submit requirements to the appropriate chemical supply point in corps rear area. Requisitions for regulated and controlled items of supply are normally submitted through command channels or to the field army chemical officer for approval, based on priorities established by the field army or corps commander.³ 3. Field army normally delivers supplies to division support areas where supplies are broken down by the chemical direct support platoon in the class II and IV distributing point. 4. Division continues unit distribution to the forward class II distributing points operating in the brigade trains. The requesting unit will pick up the supplies from the distributing point. Unit distribution to requesting unit may be used for large end items within the division. 5. Corps troops submit requirements to the supporting chemical direct support platoon. Requirements are submitted without consolidation to the supply point supporting the corps.

See footnotes at end of table.

	1	2	3	4
1	Item	Field army service area	Corps area	Unit supply procedure ¹
				6. Field army normally delivers supplies to the chemical supply point supporting the corps. Corps troops will normally draw these supplies from the chemical supply point when notified that supplies are ready for issue.
3	Chemical class V-----	1. Installation: chemical class II, IV, and V depot. 2. In addition to chemical class V items, the depot stores and issues class II and IV items. 3. Two such depots normally established in the field army service area. 4. Wholesale issue to ammunition supply points (ASP): retail to field army troops. 5. May be operated by one or more chemical general support companies. 6. Levels for class V established by theater; will normally be 5 to 15 days of operation. 7. Coverage storage for class V required—negligible. 8. When required, field army allocates class V supplies to corps. Copy of allocation to ASP. 9. Mixed flamethrower fuel is normally carried in the depot. (When units do their own mixing, they draw gasoline from class III supply point serving them and draw incendiary oil from chemical depot or ASP.)	1. Installation: ordnance ammunition supply point (ASP). 2. Activity: chemical class V supply point. 3. Chemical class V supply point is normally a part of or included in ordnance ASP. One or more of these supply points may be established in corps area, depending on needs of using troops. 4. Retail issue to corps and divisions. 5. Operated by a section of chemical depot company, section of chemical general support company, or section of chemical direct support platoon. 6. Levels established by field army; usually 2 to 3 days of operation. 7. When required, corps allocates class V chemical supplies to division and corps troops. 8. Supply point receives copies of field army and corps allocations. 9. When units do their own mixing of flamethrower fuel, they draw gasoline from the class III supply point serving them and draw incendiary oil from chemical class V supply point.	1. Brigades and separate units will draw ammunition from the field army ASP supporting corps, based on ammunition requisition authenticated by division ammunition officer (DAO). Normally the quantity requested is to replenish the basic load. 2. Corps troops accomplish their own ammunition requisition, or equivalent, and draw requirements directly from ASP in corps area. 3. Corps controls the issue of class V chemical supplies to corps troops, if necessary. 4. Division, if necessary, controls the issue to subordinate units. 5. All ammunition issues to divisions are coordinated through DAO. 6. Division units will draw ammunition directly from field army supply points.
4	Engineer classes II and IV.	1. Installation: engineer class II and IV depot. 2. Normally one per field army located in field army service area.	1. Installation: engineer class II and IV supply point. 2. Normally one per corps. Operated by engineer supply point company (TOE 5-48).	1. A division engineer dump carrying limited quantities of selected items may be operated by the division engineer battalion. It is located either at the headquarters and headquarters com-

		3. Operated by engineer depot company (TOE 5-267). 4. Levels—5 to 15 days (5,000–20,000 tons).^a Large quantities of construction materials, lumber, steel, and road material may be procured locally and not pass through the depot system. 5. Class II—issued on replacement or exchange basis on receipt of requisition approved by engineer supply officer of corps troops. Requests in excess of allowances require corps and field army engineer approval. 6. Class IV—issued on request of unit engineer supply officer. 7. Regulated items—see 4, above. 8. Maintenance companies maintain small stocks of fast-moving items and issue organizational and direct support parts for issue to the maintenance section of the infantry, mechanized, and armored division engineer battalions. Replenishment is from field army engineer depots.	3. Level—3 days (250–400 tons). Stockage generally consists of fortification or bridge materials. Corps bridge units may carry additional stocks of bridging materials.	pany of the engineer battalion or is consolidated with other divisional services near the rear echelon. In any case, fortification and camouflage materials may be left in the battalion areas, when desired. This latter method is more normal. 2. Class II—units request through division supply and transport battalion. 3. Class IV—units request through division supply and transport battalion. 4. Regulated items require approval of field army commander before items can be drawn from field army depot or supply points, based on field army or corps commander's priorities.^a 5. Supplies are brought to the division area by field army. 6. Repair parts may be obtained through the division supply and transport battalion.
5	Engineer water -----	1. Engineer water supply company. 2. Normally one per field army. 3. Production—540,000 gal—1 day. 4. Distribution—18,000-gal tank load. 5. Storage capacity—108,000 gal. 6. Used to supplement water sources of field army, corps,	1. Installation: engineer water point. 2. One to four points may be established by each corps and field army engineer battalion. 3. Maximum production, each battalion—120,000 gal. 4. Maximum storage, each battalion—12,000 gal. 5. Issue is made to all consumers who arrive at water point with empty containers.	1. Installation: Division water point. 2. One to five points may be established by the division engineer battalion. 3. Production—150,000 gal—1 day. 4. Storage capacity—15,000 gal. 5. Issue is made to unit kitchen trucks and water trailers, which are sent to water points and transport water to unit kitchens.

See footnotes at end of table.

	1	2	3	4
1	Item	Field army service area	Corps area	Unit supply procedure ¹
		and division engineers, to transport water to units without a sufficient local source, and to transport water to installations which use large quantities of water and have inadequate means to transport it.	6. Amphibious or airborne operations—water points of organic units can be in operation on D-day, 4 hours after arriving at source. Five days of supply often taken ashore in 5-gal cans and 55-gal drums and issued with class I supplies.	
6	Engineer maps -----	1. Installation: engineer map depot. 2. Normally one in field army service area located near field army headquarters. 3. Operated by map reproduction and distribution company. 4. Issues made to field army troops, corps, and divisions on basis of field army table of map allowances. 5. Normally one engineer topographic battalion performs new mapping by survey, photomapping, and reproduction, using photolithographic methods, with maximum sheet size of 22" x 29". 6. Maps are obtained from field army topographic battalion and base map depots in communications zone.	1. Normally one per corps. Operated by corps topographic company to supply division and corps troops. 2. Issues made to corps troops and divisions on basis of field army table of map allowances. 3. Map obtained from corps topographic company and field army topographic battalion.	1. Division troops receive maps from division supply and transport battalion. 2. Supply and transport battalion obtains maps from the corps engineer. 3. Division usually requires two medium-scale maps, two large-scale maps, one road map, and one aeronautical chart.
7	Medical classes II and IV.	1. Installation: medical class II and IV depot. 2. Normally one per field army located in field army service area. 3. Operated by field army medical depot (TOE 8-667). 4. Field army level—5 to 15 days.² 5. Depot restocks advance supply points and makes retail issues to units located in field army service area.	1. Installations: medical class II and IV supply point. 2. Located within easy reach of evacuation and mobile army surgical hospitals. 3. Normally there will be one advance supply point supporting each corps with the primary mission of making bulk issues to divisions and retail issues to other units and hospitals. 4. Level—2 to 3 days.	1. Division medical battalion consolidates the requirements of the units of the division and draws in bulk from the nearest medical supply point. 2. Field army makes unit distribution to divisions, and unit distribution continues within the division normally through medical channels. 3. Field army medical units draw direct from the nearest medical supply point.

		6. Regulated items require approval of the field army surgeon, based on field army commander's priorities.³ 7. Ninety percent of supplies require covered storage.		
8	Medical laboratory.	1. Installation: medical laboratory. 2. Located in field army service area. 3. Carries a stock of laboratory supplies for field army medical units.		Field army medical units draw <i>laboratory supplies</i> from field army medical laboratory located in field army service area.
9	Ordnance classes II and IV (less vehicles and artillery).	1. Installation: ordnance class II and IV depot. 2. Normally two or more located in the field army service area and/or corps rear areas. 3. Operated by one or more ordnance field supply companies (TOE 9-57). 4. Issues to field army ordnance direct and general support units and division ordnance units. Transportation normally by field army TC units. 5. Stockage objective—normally 45 days (30 days' operating level and 15 days' safety level). May be modified by major commander.	1. Field army ordnance direct support units and division ordnance units maintain stocks of selected fast-moving items. Using unit is provided supply and maintenance support by the same ordnance unit. 2. Issues to using units. Transportation by field army transportation or ordnance units, division transportation or ordnance units, or unit transportation. 3. Stockage objective—normally 30 days (20 days' operating level and 10 days' safety level). May be modified by major commander.	1. Division unit submit requirements to division supply and transport battalion. Other units submit requirements to supporting field army ordnance direct supporting unit. 2. Nonregulated items issued on requisition or direct exchange of serviceable items for unserviceable items. 3. Regulated items issued on requisition within allocation by division, corps, or field army.³ 4. Division supply and transport battalion and field army ordnance direct support units draw supplies in bulk from ordnance class II and IV depot to maintain stocks.
10	Ordnance classes II and IV (vehicles and artillery only)	1. Installation: ordnance park. 2. Normally one or more in the field army service area. 3. Operated by ordnance park company (TOE 9-137), augmented by ordnance direct support and general support units as required. 4. Issues to field army ordnance direct and general support units and to division. Trans-	1. Field army ordnance direct support units and division supply and transport battalion receive, and issue vehicles, trailers, and artillery received from ordnance park. 2. Issues to using units. Transportation normally by using unit. 3. Stockage objective—variable. Stocks in field army ordnance direct and general support units and division maintenance battalion are:	1. Division units submit requirements to division supply and transport battalion. Other units submit requirements to supporting field army ordnance direct support unit. 2. All items are normally regulated and issued on requisition within allocations by division, corps, or field army.³ Direct exchange of serviceable items for unserviceable items will be effected within maintenance float capability of supporting maintenance unit.

See footnotes at end of table.

	1	2	3	4
1	Item	Field army service area	Corps area	Unit supply procedure ¹
		portation normally by ordnance park company or field army transportation units. 5. Stockage objectives is based on a percentage of density of each type of vehicle and artillery end item in the field army plus demand data as outlined in SB 9-140. Part of this level may be located in field army maintenance and supply units.	a. Part of field army ordnance park supply level. b. Stored for issue to using units. c. Utilized as maintenance float for exchange of serviceable items for unserviceable items.	
11	Ordnance Class V (conventional ammunition).	1. Installation: Ordnance class V conventional ammunition depot. 2. Normally two or more located in the field army service area. 3. Operated by one or more ordnance ammunition companies (TOE 9-17). 4. Receives from communications zone. Maintains principal field army reserve. 5. Issues to— a. Ammunition supply points as required. Transportation by field army transportation units. b. Using units in field army service area. Transportation by using unit. 6. May store and issue chemical class V. 7. Supply level—3 to 8 days.² Total field army supply level, depot supply level, depot and ASP, is normally 5 to 15 days.	1. Installation: ordnance class V conventional ammunition supply point (ASP). 2. Normally two or more per corps located in corps rear areas. 3. Operated by ordnance ammunition company (TOE 9-17). 4. Normally receives directly from communications zone. Transportation by communications zone transportation units. May receive from field army ordnance class V depot. Transportation by field army transportation units. 5. Issues to field army, corps, and division units in corps area to fill approved ammunition requisitions. Transportation by using unit. 7. Supply level—2 to 7 days.²	1. Ammunition requisitions are normally for quantities required to fill unit basic loads or in anticipation of immediate expenditure. 2. Division units submit ammunition requisitions to DAO for authentication. Corps and field army units submit ammunition requisitions to designated corps and field army representatives for authentication. 3. Using units present approved ammunition requisitions to designated ordnance class V supply point, or depot, and draw ammunition in unit transportation.

12	Ordnance class V (special ammunition).	1. Installation: ordnance class V special ammunition depot. 2. Normally one per corps and one per field army service area. 3. Operated by one or more ordnance special weapons and ammunition general support companies (TOE 9-87). 4. Receives from communications zone. Transportation by communications zone transportation units. 5. Issues to special ammunition supply points as required. Transportation by field army transportation units. 6. Note that issues to using units in the field army service area are made by special ammunition supply points located in the field army service area. (See col 3.) 7. Supply level—classified.	1. Installation: Ordnance class V special ammunition supply point (SASP). 2. Normally one SASP per corps and one per field army service area. (See 6 in col. 2.) 3. Three SASP are normally operated by one ordnance special ammunition supply company (TOE 9-47). 4. Can receive directly from communications zone or from field army class V special ammunition depot. 5. Issues to field army, corps, and division units to fill approved ammunition requisitions. Transportation by using unit. 6. Supply level—classified.	1. Ammunition requisitions are normally for quantities required to fill unit special ammunitions load (SAL) or as specifically directed by higher headquarters. 2. Division units submit ammunition requisitions to DAO for authentication. Corps and field army units submit ammunition requisitions to designated corps and field army representatives for authentication. 3. Using units present approved ammunition requisitions to designated ordnance with existing directives.
13	Quartermaster (all classes).	1. Installation: Quartermaster Depot (all classes). 2. Three depots normally located well forward in army service area. Each depot may operate a maximum of two disposal storage sites for class I and quartermaster class II and IV supplies. Operates a permanent or semi-fixed class III storage facility, and provides local distribution of bulk class III using organic tank trucks.	1. Installation: Quartermaster Supply (all classes) and maintenance point. 2. Six per corps. Normally one per division and one per 16,000 troops supported in the corps rear area. Six per army service area (item 7, col. 2) provide local support for army troops located in the army service area. 3. Located as far forward in corps rear area as possible. Should be out of heavy artillery range; dispersed against nuclear attack; on a good road net; as concealed as possible and located to support a division or corps and army troops. Army must secure corps clearance for area location.	1. Class I: a. Infantry, mechanized, and armored division: (1) Infantry division, mechanized division, and armored division battalions, separate division units, and attached nondivisional units consolidate requirements for subordinate units and submit to Supply and Transport Battalion. (2) Supply and transport battalion consolidates requirements for division and attached units and transmits to Army Class I supply point of designated quartermaster direct support units.

See footnotes at end of table.

	1	2	3	4
f	Item	Field army service area	Corps area	Unit supply procedure ¹
		3. Operated by Quartermaster General Support Battalion (TOE 10-445). The Quartermaster Field Maintenance and Service Company (TOE 10-448) provides general support field maintenance and repair parts supply support for quartermaster equipment, and cemeterial support. As an organic unit, it may operate as a part of the depot or may be employed apart from the depot. 4. Receives, stores, issues and/or distributes all classes of quartermaster supplies for approximately 130,000 troops. Quartermaster repair parts, maintenance operating supplies, and air delivery equipment are handled exclusively by the QM Field Maintenance and Service Company (TOE 10-448). 5. Issues and/or distributes quartermaster supplies and provides general support Quartermaster services to Quartermaster Direct Support Companies (TOE 10-107), organic to Quartermaster Direct Support Battalions (TOE 10-105) located in the corps rear areas and army service area. Transportation is provided by army transportation units. 6. Levels are established by theater army, normally 5 to 7 days, based on army requirements.	4. Operated by a Quartermaster Direct Support Company (TOE 10-107) organic to Quartermaster Direct Support Battalion (TOE 10-105). 5. Supports approximately 16,000 troops. Receives, stores, issues and/or distributes all classes of quartermaster supplies. Provides direct support field maintenance and repair parts supply support for quartermaster equipment. Operates a salvage collecting point and provides graves registration, laundry, bath, and clothing exchange services. 6. Provides unit distribution for class I, class III, and quartermaster class II and IV supplies to extent permitted by organic transportation. Supplemental transportation is provided by army TC units. Provides local distribution of bulk class III using organic tank trucks. 7. Levels are established by army. Normally 3 to 5 days for units or troops supported. 8. Corps allocated regulated items to corps troops and divisions. Requisitions for regulated items require approval of appropriate commander.	(3) Class I supply point effects transport of rations to division distributing point(s), where breakdown is made in accordance with initial unit requests. Supply and transport battalion arranges delivery to units (unit distribution). (4) Supply and transport battalion maintains 2 to 3 days supply level. b. Airborne division: (1) Elements of the airborne division in making an initial assault to establish an airhead normally carry a 3 day supply of combat rations. During the assault phase, resupply of rations is air delivered direct to battalion drop zone(s) (unit distribution from departure airfield complex). Upon expansion and consolidation of drop zone(s) into an airhead, Class I will be delivered to the supply and transport company where rations will be further broken down and transported to units (unit distribution). After link-up, Army Class I supply point of designated direct support unit arranges haul of Class I requirements to division distributing point. (2) Airborne division supply and transport company hauls from division distributing point to units (unit distribution). 2. Class II and IV: a. Infantry division, mechanized division, and armored division:

7. Three Quartermaster Direct Support Battalions (TOE 10-105) are located in the army service area. Each provides local support for approximately 32,000 army troops. The battalion has two direct support companies (TOE 10-107), each capable of operating a direct support installation and providing the supply and service support indicated in column 3, item 6.
8. Army commander allocates regulated items.

- (1) Infantry division, mechanized division and armored division battalions, separate division units, and attached nondivisional units will prepare single line item requisitions (DA Form 2765, or DA Form 2765-1) and forward to the division supply and transport battalion. Direct exchange of serviceable items for unserviceable items will be effected within stockage capability of the division supply and transport battalion.
 - (2) When items cannot be supplied within the division, the division transmits requirements to the army Class II and IV supply point of the designated direct support unit.
 - (3) Direct support class II and IV supply point normally delivers supplies to division. May be included with Class I shipments when feasible.
 - (4) Class IV and regulated items require approval of appropriate commander."
- b. Airborne Division:
- (1) During initial assault phase, resupply of class II and IV items is air delivered direct to drop zone on request of battalion(s). Normally included with delivery of class I and/or class III.
 - (2) Supplies air delivered to supply and transport company in the airhead. After link-up, Army Class II and IV supply point of designated direct support unit arranges haul to division distributing point.
 - (3) Airborne division supply and transport company hauls from

	1	2	3	4
1	Item	Field army service area	Corps area	Unit supply procedure ¹
				division distributing point to units (unit distribution). 3. Class III: a. Infantry division, mechanized division, and armored division: (1) Division supply and transport battalion consolidates Class III requirements for division based on unit requests and anticipated requirements, and transmits same to Army class III supply point of designated direct support unit. (2) Normally, Class III will be moved in bulk as far forward as possible (unit distribution). However, as tactical considerations will dictate the required rate and volume of supply, it may be necessary to employ a combination of distribution methods in order to meet exceptional demands. A typical situation may involve the simultaneous use of unit, supply point, and rendezvous methods of effecting resupply from the direct support class III supply point to the division. Likewise, internal distribution within the division will be tailored to fit tactical demands. b. Airborne Division: (1) Elements of the airborne division in making an initial assault to establish an airhead normally required to have a prescribed Class III load to support its vehicles for 485 kilometers. During the assault phase, resupply of Class III is air delivered direct to battalion drop

				zone(s) (unit distribution from departure airfield complex). (2) Upon expansion and consolidation of drop zone(s) into an airhead, class III is air delivered to supply and transport company in the airhead. After link-up, army class III supply point of designated direct support unit arranges haul to division distributing point. Under sustained combat conditions the airborne division will require attachment of Class III transporters to provide capability of receiving and delivering class III in bulk quantities. (3) Airborne division supply and transport company hauls from division distributing point to units (unit distribution).
14	Signal classes II and IV.	1. Installation: signal class II and IV depot. 2. Normally two located in field army service area. 3. Operated by two signal depot companies (TOE 11-158), which are part of field army signal supply and maintenance battalion (TOE 11-155). 4. Can handle class II and IV supplies for field army. 5. Covered storage required for 75-90 percent of tonnage. 6. Field army units draw from signal depot, based on field army signal officer's approval. 7. Field army level—5 to 15 days. 8. Regulated items require approval of field army signal officer, based on field army commander's policies.³	1. Installation: signal class II and IV supply point. 2. Normally one per corps. Operated by signal forward supply and maintenance company (TOE 11-157), which is part of field army signal supply and maintenance battalion (TOE 11-155). 3. Normally corps units follow the same procedures as for divisions. 4. Based on field army's allocation of regulated items to corps, corps allocates regulated items to corps troops and divisions. Requisitions for regulated items must be approved by the field army signal officer, based on the field army commander's policies or priorities of issue.³ 5. Nonregulated items are issued on requisition or direct exchange of serviceable items for unserviceable items.	1. Units prepare single-line item requests as requirements develop and submit, without consolidation, to division supply and transport battalion. 2. When items cannot be supplied within division, the division supply and transport battalion submits a requisition, without consolidation, to the field army signal depot. 3. The field army signal supply point effects unit distribution when feasible. Otherwise, the division supply and transport battalion will pick up supplies or make arrangements for units to do so. 4. Division supply and transport battalion arranges for unit distribution to maximum extent possible. When impossible, units will be notified to pick up supplies. Some wire and the more common batteries are kept on hand and are available within reason by coming for them.

See footnotes at end of table.

	1	2	3	4
1	Item	Field army service area	Corps area	Unit supply procedure ¹
				5. Nonregulated items will be issued to, or be obtained for, division units on requisition or direct exchange of serviceable items for unserviceable items.
15	Transportation Army aircraft classes II and IV.	1. Installation: transportation Army aircraft class II and IV depot. 2. At least one located in the field army service area. 3. Operated by the transportation Army general support aircraft supply company. 4. Provides supply support to the transportation Army aircraft maintenance and supply companies, transportation aircraft direct support companies, and transportation Army general support aircraft maintenance companies. 5. Levels established by theater. Will normally be 30 days. 6. The transportation aircraft direct support company located in the field army service area will furnish supply support to aircraft assigned to units within that area. <i>Note.</i> Transportation Corps items, such as life preservers are stored in engineer class II and IV depots.	1. The transportation aircraft direct support company in each corps issues Army aircraft class II and IV supplies to the divisions and to nondivisional units in the corps area, excluding transportation transport aircraft units. 2. Nonregulated items are issued on requisition or direct exchange of serviceable items for unserviceable items. 3. Regulated items are issued on allocations by corps or field army. ³ 4. Supply level—15 days for units supported plus sufficient for own maintenance activities.	1. Divisions and nondivisional units in forward areas request and receive supplies through division supply and transport battalion. 2. Transportation transport aircraft battalions requisition and receive supplies from transportation Army aircraft maintenance and supply companies. 3. Nondivisional units operating Army aircraft from locations in the vicinity of the transportation Army general support aircraft supply company may request directly from that unit when such action is more economical. 4. In all cases, the flow of supplies may either be through the direct support unit or direct from the transportation Army general support aircraft supply company. Economy and expeditious resupply dictate the channels for the flow of supplies.

¹ The phrase "consolidate supply requirements" means for the unit to consolidate into one requisition the requirements for its subordinate and attached units. The phrase "assemble supply requirements" means for the unit to collect and edit the supply requirements for its subordinate units and forward these requirements as separate requisitions for each subordinate unit. Normal procedure is for divisions to include supply requirements for units attached to the division. This procedure is followed except when the unit is attached for a short period of time.

² General levels established by theater which are considered a part of theater stocks do not include levels in supply points, except for class V supplies.

³ Regulated items—requisitioned through command channels—however, may be issued against approved command allocations or priorities subject to approval of the support command commander. At appropriate echelons, the latter authority may be delegated to depot commanders.

CHAPTER 6

LOGISTICS—EVACUATION AND HOSPITALIZATION

Section I. ESTIMATE OF PATIENTS

6-1. Classification of Patients

a. The term *patient* includes all military personnel excused from duty because of illness, nonbattle injury, and battle wound or injury. For most purposes discussed in this chapter, only those patients who require hospitalization or who are excused from the performance of military duty and not returned to duty within the calendar day of admission to a medical treatment facility need be considered. Patients may be classified in several ways, depending upon the purpose for which such classification is made. It is important to note that not all casualties or nonbattle losses are *patients*.

b. In making estimates of patients or in computing hospital bed requirements, patients are usually classified by cause of disability into *sick/disease*, *nonbattle accident injury*, and *wounded or injured in action*. The latter group falls in the category of battle losses.

c. Patients may be classified as *hospital patients* or *quarters patients*.

d. In calculating evacuation requirements, patients may be classified by—

- (1) Severity of disability, into *walking* and *litter* patients.
- (2) Suitability for evacuation, into *evacuable* and *nonevacuable* patients.
- (3) Suitability for evacuation by air.
- (4) Type of accommodation required for evacuation, into *recumbent* and *sitting* patients.

6-2. Admission Rate

The incidence of disease, injury, and wounding is usually expressed in the military services in terms of the number of admissions per

1,000 average strength per year. The admission rate may be for all causes, for all diseases, for all nonbattle injuries, or for all battle wounds or injuries. The admission rate may also be computed for specific diseases or types of injuries. For purposes of logistical estimation or for planning for hospitalization requirements, the admission rate is most conveniently expressed as a *daily admission rate to hospital per 1,000 average strength*.

*Daily Admission Rate to Hospitals Per 1,000
Strength—All Causes¹*

<i>Years</i>	<i>Total Army</i>	<i>ETO</i>	<i>MTO</i>	<i>Pacific</i>
1942-45 ----	1.48	1.04	1.83	1.53
			<i>FECOM</i>	<i>Korea</i>
1950-53 ----	0.83	0.72	0.95	1.07

¹ In using experience factors from theaters of operation, it must be borne in mind that battle injury and wound rates are not primarily related to geography. In using such rates for planning purposes, it is necessary to consider the theater from the standpoint of type of combat, size and organization of forces, and weapons employment.

6-3. Disease and Nonbattle Injury

a. Sick/disease and nonbattle accident injuries among combat troops of a seasoned command, except in a particularly unhealthy region, may be expected to produce a daily admission rate to medical treatment facilities (hospital and quarters combined) of about 3 per 1,000 per day (0.3% per day). This *average* rate can be expected at certain seasons of the year, without epidemics, to reach 0.5 percent or even more. As an estimate for planning, *one-third* of these patients may be expected to remain under treatment in their own organization (at aid stations) or in the division clearing stations *if there is no interference with the primary mission of reception, treatment, and evacuation of casualties*. About two-thirds of the sick/disease and nonbattle accident injury cases may be evacuated from the division area.

Thus, one-third of the patients are *quarters* cases and two-thirds of the patients are *hospital* cases.

b. The daily admission rate to hospitals from sick/disease and nonbattle accident injuries is shown as follows:

*Daily Admission Rate to Hospitals Per 1,000
Strength—Sick/disease and Nonbattle
Accident Injury*

Years		Total Army	ETO	MTO	Pacific
1942-45	----	1.42	0.80	1.62	1.44
			EUCOM	FECOM	Korea
1950-53	----	0.78	0.72	0.72	0.73

This daily admission rate to *hospital* will correspond to an admission rate to *hospital and quarters* of about 0.3 percent and soon will result in a constant noneffective rate of about 4.5 percent. For unseasoned troops in the same climatic condition, the noneffective rate may reach 6 percent and will be even higher under unfavorable conditions of climate and location.

c. On the basis of experience in the Mediterranean Theater of Operations during World War II for *sick/disease and nonbattle accident injury*, it may be expected that about 0.2 percent will die, 4 percent will be evacuated to the continental United States (CONUS), and the remainder, 95.8 percent, eventually will return to duty. The average stay in hospitals in a theater for nonbattle cases admitted to hospitals overseas during World War II was 19 days; while the total average hospitalization, including time spent in CONUS hospitals, was 25 days.

d. For planning purposes, certain additional estimated daily *hospital* admission rates from *sick/disease and nonbattle accident injuries* in overseas commands are as follows:

*Estimated Sick/Disease and Nonbattle Accident Injury
Hospital Admission Rate (Admissions Per 1,000
Average Strength Per Day)*

Major overseas command	Daily rate per 1,000
Alaska -----	0.9
Austria -----	0.8
Caribbean -----	1.0
Europe -----	1.0
Far East -----	1.2
Pacific -----	0.9

The rates shown above have been prepared to provide data for future planning. The data

have been based on Army experience of the 2 fiscal years from July 1950 through June 1952. It should be borne in mind, however, that these rates reflect an experience unlike that of World War II. During World War II, U.S. Army troops were engaged in combat in several major overseas areas. In the experience on which the above rates have been based, all areas were free from the effect of combat with the exception of the Far East. Because of such limitations, care should be exercised in the use and interpretation of the data shown above.

6-4. Wounded or Injured in Action

a. In estimating battle injuries and wounds, many variable factors must be considered. These include type of troops, their location in the theater, type of engagement, and enemy capabilities. For this reason, it is desirable in such estimations to separate all troops in a theater into groups having approximately the same casualty rate and compute the patients separately for each group on the basis of their numerical strength. *For example*, in a given theater the troops may be grouped into combat divisions, other ground troops in the combat zone, Air Force troops, and troops in the communications zone. Each of these groups will have a different battle injury and wound rate, and the total patients in the theater will depend on the relative strength of each group.

b. The average daily admission rates for U.S. Army (excluding Air Corps personnel) battle casualties in various theaters during World War II and the Korean War were as follows:

*Daily Admission Rate to Hospitals Per 1,000
Strength—Wounded or Injured in Action¹*

Years		Total Army	ETO	MTO	Pacific
1942-45	----	0.03	0.38	0.25	0.11
			EUCOM	FECOM	Korea
1950-53	----	0.05	----	0.22	0.34

¹ In using experience factors from theaters of operation, it must be borne in mind that wounded or injured in action rates are not primarily related to geography. In using such rates for planning purposes, it is necessary to consider the theater from the standpoint of type combat, size, and organization of forces, and weapons employment.

c. In estimating battle injury and wound patients in a field army, an estimate based on combat divisions engaged usually will be more accurate than one based on a rate for corps or the field army.

d. Considerable variation in battle injury and wound admission rates among Air Force troops occurs, depending on the type of aircraft, type of mission flown, and amount of enemy air resistance. As an overall average, which necessarily must be modified to apply to any special situation, battle injury and wound admission rate for all air troops can be taken as 0.2 per 1,000 per day. More commonly, casualties in Air Force troops are computed on the basis of the number of man-missions flown.

e. The number of battle injuries and wounds among communications zone troops, except in special situations, has been negligible in the past. However, planners in future warfare must consider the possibility of mass casualties in rear areas.

f. The ratio of killed and wounded among casualties has been estimated as follows: (The figures do not include prisoners or persons missing in action.)

World War II—Infantry

	<i>Ratio of killed to wounded— World War II and Korea</i>
European Theater of Operations -----	1:4
Mediterranean Theater of Operations ---	1:4
U.S. Army forces in Pacific -----	1:4
All theaters combined -----	1:4
Total air forces, all theaters -----	5:4
Armored, all theaters -----	2:7
Artillery, all theaters -----	1:4
<i>Korea</i>	
Infantry -----	1:4
Armored -----	1:4
Artillery -----	1:4

- (1) In temperature and tropic zones, the overall ratio of killed to wounded may be taken as 1:4.
- (2) In the arctic zones, the ratio of killed to wounded may be considerably higher because of the rapid death of the wounded from exposure to cold.
- (3) On the basis of experience in World War II (in general, under a 120-day evacuation policy), it may be expected that about 4 percent of the wounded

who reach hospitals will die; about 25 percent will be invalided home, and the remaining 71 percent will be returned to duty in the theater. Of those evacuated to CONUS, about 45 percent will return to duty. The average stay of wounded personnel in oversea and CONUS hospitals in World War II was 94 days.

- (4) Of the wounded who reached hospitals in World War II, about 4 percent died and about—

17 percent recovered in 15 days.
13 percent recovered in 16 to 30 days.
17 percent recovered in 31 to 60 days.
11 percent recovered in 61 to 90 days.
20 percent recovered after 90 days.
18 percent were separated from the Army.

- (5) Of the wounded who reached hospitals in the Korean War, about 2 percent died and about—

17 percent recovered in 15 days.
15 percent recovered in 16 to 30 days.
24 percent recovered in 31 to 60 days.
12 percent recovered in 61 to 90 days.
21 percent recovered after 90 days.
9 percent were separated from the Army.

- (6) In World War I¹, it was found that of the gas casualties who reached hospitals approximately—

2 percent died.
25 percent recovered in 15 days.
27 percent recovered in 16 to 30 days.
24 percent recovered in 31 to 60 days.
16 percent recovered after 60 days.
6 percent were of no further military value.

- (7) In World War I¹, the average stay of gas casualties in oversea and CONUS hospitals was 41.3 days.

6-5. Statistics

The following tables represent statistics from World War II. To be used as staff planning factors, they may require modifications, depending on the conditions anticipated.

¹ The figures are based on World War I chemical agents, tactics, and medical treatment methods. These figures may be expected to change greatly with modern chemical agents.

a. Average Daily Admission Rate Per 1,000 From All Causes.

	1	2	3	4	5	6
1	Combat conditions	Inf div	Armd div	Abn div	Combat zone	COMMZ
2	Heavy -----	8	7	11	5	1.5
3	Average -----	4	4	4	3	1.5
4	Light -----	2	2	2	2	1.5

b. Average Daily Admission Rate Per 1,000 Air Force Troops.

	1	2	3	4
1	Location	Sick/disease and non-battle accident/injury	Wounded or injured in action	Total
2	Pacific areas ¹ -----	2.01	0.02	2.03
3	European areas ² -----	1.87	0.27	2.14
4	Average active combat.	1.80	0.20	2.00

¹ Includes Far East air forces, Twentieth Air Force, and China-Burma-India air forces.

² Includes air forces in European and Mediterranean Theaters of Operation.

Section II. FIXED-BED REQUIREMENTS

6-6. General

The hospital requirements of a theater of operations are computed in terms of total beds in hospitals capable of performing all types of treatment, not in terms of medical units. The total authorization to meet these requirements is expressed as the fixed-bed allotment of the theater of operations. Medical units of the combat zone and a convalescent center of the communications zone are not included in the computation. Field hospitals are included in this allotment only when they are employed as fixed hospitals in the communications zone. In general, the fixed-hospital bed requirements of a theater of operations are satisfied by the assignment to the communications zone of appropriate numbers of general hospitals and station hospitals. For classified data pertaining to fixed-bed requirements, see FM 101-10-3, chapter 5, section VII.

6-7. Basic Data

a. Methodology. For most planning purposes, requirements for fixed beds in a theater of operations can be determined by using a factor of seven percent of the theater of operations strength. This short method is recommended for planning for an entire theater of operations only and is not applicable for individual segments of any theater. Computation of fixed bed requirements for specific situations, or in cases which require more detailed data should be made using the method described in *b* through *h* below.

b. General. To compute bed requirements for any specific situation, certain basic data are necessary. These are—

- (1) Time period covered. (Period of estimate, usually 30-day intervals)
- (2) Troop strength ---- (Population covered)
- (3) Daily admission rate. (Rate of generation of patients)
- (4) Experience factors for accumulation of patients, dependent on evacuation policy. (Rate of patient-load growth)
- (5) Dispersion factor --- (Patient-bed conversion factor)

All experience factors ((4) above) are based on the proportion of patients out of those admitted to hospital on 1 day and still remaining on each succeeding day. When these daily remaining factors (proportions) are accumulated by intervals of 30 days, the resultant accumulation factors (see table in *e* below) can be used directly, providing the admission rate, troop strength, and evacuation policy are assumed to be constant. However, when any or all of the elements of admission rate, troop strength, or evacuation policy vary for one or more of

the 30-day intervals in the time period covered, the daily remaining factors (see table in *f* below) may be accumulated through a 30-day period, at which time admissions cease, and then decumulated each succeeding day thereafter. For tables of factors to be used for such computations and their detailed method of use, see FM 8-55.

c. Daily Admission Rates. See paragraph 6-2.

d. Evacuation Policy. The evacuation policy of a joint theater of operations is established by the Secretary of Defense, usually on the recommendation of the Joint Chiefs of Staff, theater commander, or the military departments. It determines which patients will be evacuated to CONUS by designating a maximum number of days for the allowable period of hospitalization within the theater. Patients who, in the opinion of responsible medical officers, cannot be returned to duty status within the period prescribed, are to be returned to CONUS by the first available and suitable transportation, providing the travel required will not aggravate their disabilities. In using the evacuation policy to determine theater fixed-bed requirement, the periods usually considered are 15, 30, 60, 90, or 120 days.

- (1) *Evacuation policies within a theater* may be established for certain areas and for certain types of medical facilities, specifying which patients will be evacuated to the next higher echelon of medical care. For example, a shorter evacuation policy may be established for station hospitals than for the theater as a whole. This will mean that patients admitted to station hospitals whose recovery is likely to require more than the number of days in the shorter policy will be evacuated to general hospitals. This operation will in no way affect the total fixed-bed requirements of the theater, providing proper adjustment is made in the distribution of total theater fixed beds between station and general hospitals on the basis of their different evacuation policies.

- (2) Certain flexible evacuation policies, useful as guides but varying with manpower policies, admission rates, and available beds, may be established for the combat zone.
- (3) By setting a maximum for the number of days a patient may be retained in theater hospitals, the evacuation policy exercises a limiting effect on the growth of the patient-load in the theater. While the evacuation policy alone does not enter directly as a computational factor in the estimation of fixed-bed requirements, it does determine which set of accumulation factors it is appropriate to use.

e. Accumulation Factors. Accumulation factors indicate how many patients will have accumulated as specified periods of time after the beginning of operation, based on a constant admission rate of one patient per day and a constant fixed evacuation policy. Separate sets of factors are provided for the different evacuation policies and for the separate theater and CONUS accumulation of patients as affected by these evacuation policies.

f. Remaining Factors. Remaining factors show for the number of patients admitted on any 1 day the proportion still remaining on each day thereafter. This provides the data from which tables of accumulation factors and accumulation-decumulation factors are based. However, the application is a lengthier process, since computations by single days of operation are necessary.

g. Time Period Covered. The time period in a particular estimate is that period from the beginning of operations to a maximum number of days of operations which are included in the estimate. Experience factors for patient-load growth are always related to *periods of estimate*, which are included in the overall time period covered. These periods of estimate are usually stated in 30-day intervals. Accumulation factors are always directly related to that period of estimate which is equal to the maximum number of days in the time period covered; i.e., an accumulation factor at the 90-day interval is used for a 90-day period of estimate.

Accumulation Factors (Periods of estimate in intervals of 30 days)*

FM 101-10-1

	1	2	3	4	5	6	7	8	9	10	11	12
1	Periods of estimate	THEATER FACTORS								Sick/ disease and non- battle accident/ injuries	Wounded or injured in action	Periods of estimate
		Evacuation policies										
		120-day		90-day		60-day		30-day				
		Sick/ disease and non- battle accident/ injuries	Wounded or injured in action	Sick/ disease and non- battle accident/ injuries	Wounded or injured in action	Sick/ disease and non- battle accident/ injuries	Wounded or injured in action	Sick/ disease and non- battle accident/ injuries	Wounded or injured in action			
2	30	13.43	22.96	13.34	22.39	13.11	21.04	11.40	16.44	7.32	10.80	30
3	60	16.46	33.38	15.95	31.00	14.67	25.57	11.40	16.44	7.32	10.80	60
4	90	17.67	37.36	16.51	32.87	14.67	25.57	11.40	16.44	7.32	10.80	90
5	120	17.94	38.27	16.51	32.87	14.67	25.57	11.40	16.44	7.32	10.80	120
6	150 and over.	17.94	38.27	16.51	32.87	14.67	25.57	11.40	16.44	7.32	10.80	150 and over.
7	Periods of estimate	CONUS FACTORS								6.24	13.71	Periods of estimate
		0.13	1.55	0.22	2.12	0.45	3.47	2.16	8.07			
		0.76	6.88	1.27	9.26	2.55	14.69	5.82	23.82			
		1.80	13.43	2.69	17.92	4.80	25.22	8.07	34.35			
		3.06	20.35	4.49	25.75	6.33	33.05	9.60	42.18			
		4.05	26.59	5.48	31.99	7.32	39.29	10.59	48.42			
		4.67	31.66	6.10	37.06	7.95	44.36	11.21	53.49			
		5.05	35.86	6.48	41.26	8.32	48.56	11.59	57.69			
		5.29	39.40	6.72	44.80	8.56	52.10	11.83	61.23			
		5.44	42.37	6.87	47.77	8.71	55.07	11.98	64.20			
		5.54	44.89	6.97	50.29	8.81	57.59	12.08	66.72			
		5.60	47.02	7.03	52.42	8.87	59.72	12.14	68.85			
		5.64	48.79	7.07	54.19	8.91	61.49	12.18	70.62			
		5.67	50.26	7.10	55.66	8.94	62.96	12.21	72.09			
		5.70	51.46	7.13	56.86	8.97	64.16	12.24	73.29			
		5.71	52.39	7.14	57.79	8.98	65.09	12.25	74.22			
		5.72	53.14	7.15	58.54	8.99	65.84	12.26	74.97			
		5.73	53.71	7.16	59.11	9.00	66.41	12.27	75.54			
		5.73	54.16	7.16	59.56	9.00	66.86	12.27	75.99			
		5.73	54.52	7.16	59.92	9.00	67.22	12.27	76.35			
5.73	54.79	7.16	60.19	9.00	67.49	12.27	76.62					
5.73	55.00	7.16	60.40	9.00	67.70	12.27	76.83					

* Based on constant admission of one per day under stated evacuation policies.

Patients Remaining in Hospital Anywhere, by Type of Patient (Remaining factors for patients admitted to hospital on any 1 day of operations based on admission of one on a day of operations in theater)

1	2	3	4	5	6	7	8	9
Complete hospital days	Sick/disease and nonbattle accident/injuries	Wounded or injured in action	Complete hospital days	Sick/disease and nonbattle accident/injuries	Wounded or injured in action	Complete hospital days	Sick/disease and nonbattle accident/injuries	Wounded or injured in action
1	1,000	1,000	31	0.167	0.650	65	0.086	0.393
2	0.974	0.984	32	0.163	0.640	70	0.079	0.370
3	0.926	0.972	33	0.158	0.631	75	0.076	0.350
4	0.865	0.950	34	0.155	0.620	80	0.070	0.331
5	0.797	0.942	35	0.150	0.611	85	0.065	0.315
6	0.730	0.927	36	0.147	0.602	90	0.062	0.298
7	0.669	0.911	37	0.144	0.592	95	0.057	0.284
8	0.610	0.897	38	0.140	0.583	100	0.054	0.272
9	0.557	0.883	39	0.136	0.575	105	0.051	0.260
10	0.513	0.870	40	0.131	0.566	110	0.049	0.250
11	0.481	0.860	41	0.129	0.557	115	0.046	0.241
12	0.445	0.850	42	0.127	0.549	120	0.043	0.232
13	0.425	0.840	43	0.125	0.540	130	0.036	0.216
14	0.399	0.828	44	0.122	0.532	140	0.031	0.200
15	0.375	0.817	45	0.120	0.524	150	0.026	0.187
16	0.351	0.806	46	0.116	0.516	160	0.025	0.174
17	0.332	0.795	47	0.115	0.508	170	0.021	0.163
18	0.316	0.784	48	0.113	0.500	180	0.016	0.154
19	0.302	0.772	49	0.109	0.492	210	0.010	0.128
20	0.285	0.761	50	0.107	0.485	240	0.006	0.109
21	0.271	0.750	51	0.106	0.477	270	0.004	0.092
22	0.258	0.740	52	0.105	0.470	300	0.003	0.078
23	0.246	0.730	53	0.103	0.464	330	0.002	0.065
24	0.235	0.720	54	0.101	0.457	360	0.001	0.054
25	0.224	0.708	55	0.100	0.450	390	0.001	0.044
26	0.213	0.700	56	0.098	0.444	420	0.001	0.036
27	0.205	0.690	57	0.096	0.438	450	0.000	0.028
28	0.196	0.680	58	0.095	0.432	480	0.000	0.022
29	0.189	0.670	59	0.094	0.425	510	0.000	0.017
30	0.173	0.660	60	0.091	0.420	540	0.000	0.013
						and over		

Remaining factors, however, are related to each separate daily interval included in the overall estimate, depending on the maximum number of days a particular day of admission contributes to the overall time period covered. For example, this process would include 90 separate daily intervals within a 90-day period of estimate.

h. Dispersion Factor. At any given time, a certain proportion of theater fixed beds will not be immediately available to patients because of "dispersion." (A 20-percent allowance for dispersion was generally used during World

War II.) Factors contributing to dispersion are as follows:

- (1) A certain number of beds must be packed and in transit. The greater the mobility of the troops, the greater the allowance required.
- (2) Smaller troop units operating at some distance from the main body of troops must be supported by complete hospital units, even though it is realized that the troop unit will not be likely to use fully the hospital facilities provided.

- (3) The general practice of prescribing separate wards for patients of different sexes, cases of contagious diseases, and for cases requiring different types of treatment necessitates a safety margin in each ward since the proportion of the various classes will vary from time to time.

- (4) Factors to be applied to number of patients to convert to number of fixed beds required under each specified dispersion allowance are as follows:

Dispersion allowance (percentage)	Dispersion factor
5 -----	1.05
10 -----	1.11
15 -----	1.18

Dispersion allowance percentage	Dispersion factor
20 -----	1.25
25 -----	1.33
30 -----	1.43
35 -----	1.54
40 -----	1.67
45 -----	1.82
50 -----	2.00

6-8. Computations

a. Given the items of basic data, the fixed-hospital bed requirements for a specific situation, wherein the elements of admission rate, troop strength, and evacuation policy are assumed to be *constant* during the time period covered can be computed according to the following formula:

Daily admission rate	×	Average strength (thousands)	×	Accumulation factor at time period covered in estimate	×	Dispersion-factor	=	Fixed beds
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Example: Theater "A" has a troop strength of 500,000. Expected daily admission rates per 1,000 are as follows: sick/disease and nonbattle accident/injuries, 0.73; conventional battle

injuries and wounds, 0.34. Theater evacuation policy is to be 120 days and the dispersion allowance is 20 percent. How many fixed-hospital beds will be required at the end of 90 days?

	Admission rate	×	Troop strength (thousands)	×	Accumulation factor (90 days)	×	Dispersion factor	=	Fixed beds
Sick/Disease and nonbattle accident/injuries -----	0.73	×	500	×	17.67	×	1.25	=	8,062
Conventional battle losses -----	0.34	×	500	×	37.36	×	1.25	=	7,939
Total fixed beds required at the end of 90 days -----									16,001

In the above example, the accumulation factors were obtained from the table in paragraph 6-7e. The proper accumulation factor is shown on line 4 in both instances—column 2 for sick/disease and nonbattle accident injury patients; and column 3 for battle injury and wound patients.

b. When, one, two, or all three of the elements of admission rate, troop strength, or evacuation policy vary from day to day within the time period covered, the fixed-bed requirements can be computed according to the following formula:

<i>Day of operation</i> ¹	<i>Intervals of period of estimate</i>					
1	Time period covered	} Admission rate for respective day of operation	×	Average strength (thousands) for respective day of operation	×	Remaining factor at respective daily interval applicable to day of operation.
2	Next lower daily interval					
3	Next lower daily interval					
4	Next lower daily interval					
5	Next lower daily interval					
Etc.	Etc., to lowest interval (1 day)					

¹ Each day is computed separately, the products added, and the sum of the products is then multiplied by the dispersion factor. However, when the daily admission rate and average strength are constant, the respective remaining factors through a given time may be added. The sum obtained is then multiplied by the product of the daily admission rate times the average strength (in thousands). The product thus obtained is then multiplied by the dispersion factor.

- (1) For evacuation policies shorter than 30 days, the number of days in the stated evacuation policy, less 1 day, is always the time period covered as shown in the above formula. For example, under a 10-day evacuation policy, patients admitted on any 1 day of operations, and who are remaining after 10 complete hospital days, represent the number from any day's admission who cannot be returned to duty status within the time allowed (10 days) and, therefore are evacuated from the theater between 1 and 9 days after admission to hospital. Under a 10-day evacuation policy the maximum accumulation of patients in theater hospitals can only be the sum of these patients who have lost from 1 to 9 complete hospital days at any period of operations. Patients from any 1 day's admission who are remaining in *theater hospitals* at the beginning of the tenth hospital day are those who will be returned to duty in the theater on the tenth day.
- (2) For evacuation policies of 30 days or longer, the number of days in the stated evacuation policy is always the time period as shown in the formula. Since the accumulation factors take into account the place of hospitalization (theater or CONUS) in addition to the hospital days in theater prior to evacuation, the accumulation of the remaining factors from the first day through the number of days of the evacuation policy will always equal the sum of the theater and CONUS accumulation factors at that point in time. This is also true for the 15 day evacuation policy when the accumulation is made through 30 days. Therefore, the proportion who are theater patients is readily available from the accumulation factors (see table in para 6-7e). The difference between these longer policies and the 10-day

evacuation policy is that CONUS patients, who are represented by the remaining factors beginning at 10 complete hospital days, are not included in the computation for the shorter policy. In order to include CONUS patients under the shorter evacuation policies, the remaining factors would then be accumulated through the number of days in the overall period of estimate. The sum of the remaining factors from 10 days through the number of days in the period of estimate represents the proportion who are CONUS patients. (For problem examples, see FM 8-55, ch. 8).

c. Nuclear, Biological, and Chemical Warfare. While the preceding computation afford a relatively sound basis for determining fixed-bed requirements, nuclear, biological, and chemical warfare introduces other factors. The experience factors presented in this chapter have been derived in the presence of a certain pattern of wounding and are related to average admission rates over long periods. The pattern of wounding from nuclear, biological, and chemical weapons will probably alter accumulation factors. Of greatest significance, however, may be the characteristic wide fluctuation of daily admission rates resulting from these weapons. This characteristic may render any attempt to employ average admission rates futile. The problem will be one of handling recurring peak-loads of patients. This problem must be met either by very efficient use of theater hospital facilities or by rapid and extensive evacuation to CONUS. For this reason, the planner may find it more realistic to submit fixed-bed requirements as a feasible percentage of troop strength supported and build the maximum flexibility into the resulting medical service. There are, however, factors and methods for estimating hospitalization and evacuation requirements. Under nuclear warfare, this material is given in FM 101-10-3, section VII, chapter 5.

6-9. Continental United States

a. Fixed beds are required in CONUS for those troops who do not depart for theaters of operations. When new recruits are being inducted in large numbers, morbidity tends to be rather high and beds equal in number to as much as 4 percent of the CONUS strength may be necessary. After the period of training is over, beds equal in number to about 3 percent of the CONUS strength may be sufficient.

b. It is also necessary to compute bed requirements for those cases evacuated from theaters of operation. These additional beds are estimated on the basis of the expected numbers of evacuees arriving in CONUS (disease and non-battle injury and casualty cases being separately considered) and the average duration of stay of such cases in CONUS hospitals.

*Accumulation of Theater of Operations Patients in CONUS Hospitals—
120-Day Evacuation Policy **

	1	2	3	4	5	6	7	8
1	Cause of admission	Daily hospital admission rate per 1,000	Accumulation of theater patients in CONUS hospitals per 1,000 theater strength after number of days indicated following start of operations in the theater					
			60	90	120	180	260	540
2	Sick/Disease and nonbattle accident/injury -----	1.0	0.60	1.07	1.50	3.11	4.08	4.17
3	Wounded or injured in action -----	0.6	2.05	5.20	8.79	16.32	26.43	28.48
4	Total patients -----		2.65	6.27	10.29	19.43	30.51	32.65
5	Increase by 26 percent -----		0.66	1.57	2.57	4.86	7.63	8.16
6	Total beds required -----		3.31	7.84	12.86	24.29	38.14	40.81

* Based on July to December 1944 ETO admission rates.

c. Using the data given for the problem in paragraph 6-8a, the accumulation of theater of operations patients in CONUS hospitals

after 90, 150, and 360 days of operation in the theater (under a 120-day evacuation policy) may be determined as follows:

	Daily admission rate	Troop strength (thousands)	Accumulation factors		
			90 days	150 days	360 days
Sick/disease and nonbattle accident/injury -----	0.73	× 500	× 1.80	4.05	5.64
Conventional battle losses -----	0.34	× 500	× 13.43	26.59	48.79
Total patients—					
Sick/disease and nonbattle accident/injury -----			657	1,478	2,059
Battle injury and wound -----			2,283	4,520	8,294
			2,940	5,998	10,353
Dispersion allowance 20 percent -----		× 1.25	× 1.25	1.25	1.25
Total beds required -----			3,675	7,498	12,941

In the above example, the accumulation factors were obtained from the table in paragraph 6-7e, lines 9, 11, and 18, respectively—column 2 for sick/disease and nonbattle accident/injury patients and column 3 for battle injury and wound patients.

d. To the above figures must be added an

allowance, when appropriate, for care of Navy, Air Force, Allied military personnel, Allied civilians, and prisoners of war. The additional number of fixed beds for such purposes will depend on the particular area involved, and no definite figures can be given.

Section III. PATIENT EVACUATION

6-10. Planning Factors

a. Sick/Disease and Nonbattle Accident/Injuries.

Evacuated From Theater Out of Admissions During 1 Month of Operations

	1	2	3	4	5	6	7
1	Evacuation policy	Percentage during specified interval					Total evacuated from theater
		1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	
2	120-day -----	0.44	1.73	1.49	0.88	0.19	4.73
3	90-day -----	0.74	2.83	2.26	0.60		6.43
4	60-day -----	1.51	5.57	2.16			9.24
5	30-day -----	7.22	10.08				17.30
6	15-day -----	26.89	10.61				37.50

b. Wounded or Injured in Action.

Evacuated From Theater Out of Admissions During 1 Month of Operations

	1	2	3	4	5	6	7
1	Evacuation policy	Percentage during specified interval					Total evacuated from theater
		1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	
2	120-day -----	5.15	12.62	4.06	1.34	0.23	23.40
3	90-day -----	7.07	16.74	5.07	0.98		29.86
4	60-day -----	11.56	25.84	4.60			42.00
5	30-day -----	26.90	39.10				66.00
6	15-day -----	49.99	31.75				81.74

6-11. Capacity of Transportation

	1	12	13
1	Type of transportation	Patients	
		Ambulatory or litter	
2	Transport airplane (C-97) -----	60	50
3	Transport airplane (C-118) -----	60	54
4	Transport airplane (C-119) -----	40	30
5	Transport airplane (C-121) -----	60	60
6	Transport airplane (C-123) -----	40	30
7	Transport airplane (C-124) -----	60	60
8	Transport airplane (C-130) -----	60	60
9	Transport airplane (C-141) -----	94	90
10	Army airplane (O-1A) -----	1	
11	Army airplane (U-6A) -----	4	2
12	Army airplane (U-8D) -----	5	
13	Army airplane (CV-2B) -----	32	16
14	Army airplane (OV-1A) -----		
15	Army helicopter (OH-13H) -----	2	2
16	Army helicopter (UH-19D) -----	3	3

See footnotes at end of table.

	1	12	13
1	Type of transportation	Patients	
		Ambulatory or litter	
17	Army helicopter (CH-21C) -----	12	12
18	Army helicopter (OH-23C & D) --	2	2
19	Army helicopter (CH-34A) -----	18	8
20	Army helicopter (CH-37A) -----	28	24
21	Army helicopter (UH-1B) -----	7	7
22	Army helicopter (UH-1D) -----	11	6
23	Army helicopter (CH-47A) -----	33	24
24	Bus, motor, 37-passenger, convertible -----	37	18
25	Truck, ambulance, frontline, ¼-ton, 4 x 4 -----	5	2
26	Truck, cargo, 2½-ton, 6 x 6 ² --	16	18
27	Truck, ambulance, field, ¾-ton, 4 x 4 -----	8	5
28	LARC-5 ² -----	³ 25	12
29	LARC-60 -----	125	
30	Railway car, coach (U. S.) -----	52	
31	Railway car, coach (foreign) -----	57-72	

1	Type of transportatoin	Patients	
		Ambulatory or litter	
		2	3
32	Pullman car (U. S.) -----	48	32
33	Sleeping car (foreign) -----	32	32
34	Ambulance car, ward (U. S.) -----	35	35
35	Ambulance car, ward (foreign) -----	30	30
36	Ambulance car, personnel (foreign) -----	21	21
37	LVT -----	12	6
38	LVTP-5 -----	34	-----
39	LVTP-6 -----	20	-----
40	LCVP -----	36	⁴ 17
41	LCM (6) -----	120	30
42	LCM (8) -----	⁵ 200	⁶ 50
43	LCU -----	400	100
44	LST -----	180	120
45	Hospital ship (AH) -----	802	802

¹ Exact figures for Army aircraft in columns 2 and 3 must be computed on maximum gross weight. (See para 7-43b.)

² To be used only when ambulance-type vehicles are not available.

³ No troop seats provided.

⁴ Only seven litters if LCVP is to be hoisted aboard for loading.

⁵ In addition to litter patients.

⁶ In addition to ambulatory patients.

6-12. Time Elements of Evacuation

The following are factors for evacuation of personnel (including loading and unloading):

a. Litter Squads.

- (1) Average terrain, four man squad—900 meters and return in 1 hour.
- (2) Mountainous terrain, six man squad—370 meters and return in 1 hour.

b. Ambulance, Motor During Combat in Division Area. Eight kilometers, one-way and return in 1 hour.

c. Aircraft

- (1) *Helicopter*. 80 kilometers, one way in 1 hour.
- (2) *Transport airplane*. 160 kilometers, one way in 1 hour.
- (3) *Army airplane*. 120 kilometers, one way in 1 hour.

CHAPTER 7

LOGISTICS—TRANSPORTATION

Section I. GENERAL

7-1. Chapter Contents

This chapter contains detailed unclassified data on transportation capabilities and methods of computing transportation requirements. The contents have been organized to present a general section on transportation planning and a separate section on each of the major means of transportation required to support military operations. (For classified data pertaining to transportation, see FM 101-10-3, ch. 5.)

7-2. Transportation Estimates and Plans

a. Transportation estimates and plans are necessarily dependent on the user of transportation, whose firm requirements are often not available until after tactical plans and supply service plans have been completed. In order for transportation planners to plan concurrently with other staff agencies, it is often necessary for them to adopt methods of utilizing troop strength and requirement factors that will permit a reasonable estimate of transportation requirements in broad terms, to be defined at a later date in terms of class and service (or item) of supplies and categories of personnel or troop units

b. Transportation planning embraces the following:

- (1) Surveying existing and potential facilities for movement of troops and supplies.
- (2) Selecting the available means of movement which provide the greatest flexibility, based on a study of the existing and potential facilities.
- (3) Planning for the maximum utilization of carrying capacity.
- (4) Insuring that the transportation plan provides for flexibility.

7-3. Capabilities of Lines of Communications

a. The capabilities of lines of communications are quantitative statements of the ability of the lines to transport cargo or troops and are usually expressed in tons (long or short) or troops per day. Frequently, troops per day may be equated to tons per day to provide a common unit of measure. A ton-mile is the actual movement of 1 ton 1 mile.

b. Transportation capabilities are dependent on the following factors:

- (1) Number, lift capacities, and speed of available transportation mediums.
- (2) Environmental factors (terrain, climate, etc.) influencing the operating characteristics of the transport vehicles.
- (3) Distances between origins and destinations
- (4) Loading and unloading capabilities.
- (5) Maintenance capabilities.
- (6) Turnaround time (time required for one vehicle to complete one cycle). This dependent on the above factors, as well as refueling time and other incidental time consumed in the normal operation of the mode.
- (7) Critical density. This refers to the number of vehicles which will provide the maximum tonnage rate over a line of communications during a specified period considering the above factors.
- (8) Efficiency of management, operating, and maintenance personnel.

c. Efficiency of management is an intangible factor, which may enter arithmetical calculations of capability only by experience or esti-

mate. Such efficiency is dependent on number and skill of operating personnel, degree of intelligent movement planning, and effectiveness of operating technique.

7-4. Advance Transportation Planning Factors

When it is desirable to obtain an estimate of transportation requirements well in advance of detailed planning, the following general averages may be used:

a. Cargo Ships.

Capacity ----- 5,600 short tons of Army cargo.
 Discharge rate ----- 720 short tons per day discharging alongside berth.
 Beach capacity ----- 1,700 short tons per 1,000 yards of beach.
 Light amphibian (LARC-5) company capacity. 1,080 short tons per company per day.
 Loading rate ----- 500 short tons per day loading alongside berth or in stream.
 Medium boat company capacity. 720 short tons per company per day.
 Heavy boat company capacity. 1,440 short tons per company per day.

b. Typical Shipping Requirements for an Assault Division Slice of 25,000 Men.

	1	3	2
1	Type	Short voyage (2-3 days)	Extended voyage (10 days)
2	AGC (amphibious force flagship).	1	-----
3	APA (transport, attack) -----	10	1
4	AKA (cargo ship, attack) -----	2	2
5	LST (landing ship, tank) -----	25	50
6	LSD (landing ship, dock) -----	7	7
7	LPH (landing platform, helicopter).	6	6
8	LPD (landing platform, dock) --	7	7

c. Water Terminal and Beach Operations
 Unless other factors govern to provide dispersion and to present less favorable targets to the enemy, plans should provide for the discharge of not less than 40 percent of tonnage over the beach and through shallow-draft facilities. As friendly capabilities decrease and as destructive magnitude of enemy weapons in-

creases, this "over-the-shore" proportion should be increased to reduce dependence on major water terminals to support military operations.

d. *Percentage of Organizations and Supply Moved in Assault or Cargo Craft in Amphibious Operations.* Supply as used below refers to accompanying supply. After the assault phase, supply is by cargo shipping only, except for emergency supply. Percentages are as follows (to be used only when assault lift is not known):

- (1) Eighty percent of the total personnel moved in assault naval shipping.
- (2) Twenty percent of the total personnel moved in cargo-type shipping.
- (3) Sixty percent of the organizational equipment and supplies for units moved in assault naval shipping will accompany the units transported in that shipping.
- (4) Forty percent of the organizational equipment and supplies for units moved in assault naval shipping will be transported in cargo-type shipping.
- (5) Because of space or other factors, it sometimes is not possible to move all of the organizational equipment and supplies of a unit on the same ship. These supplies and equipment, in such case, may be moved on another ship of the same convoy, providing sufficient personnel from the parent unit accompany them.

e. Railways (Foreign Countries).¹

- (1) *Standard gage (56½ in/1.435 m).*¹

Single track -- 10 trains (4,000 short tons) per day in each direction (will support about 6 divisions).

Double track -- 30 trains (12,000 short tons) per day in each direction (will support about 18 divisions).

Train load ---- 400 short tons of cargo (20 cars at about 20 tons each) or 1,000 troops (40 boxcars at 25 troops each).

- (2) *Narrow gage* (36 in/0.914 m, 39 $\frac{3}{8}$ in/1.00 m, and 41 in/1.067 m).

Single track -- 10 trains (3,000 short tons) per day in each direction

Train load ---- 300 short tons of cargo (20 cars at about 15 tons each) or 500 troops (20 boxcars at 25 troops each).

f. Highways (Supply Traffic in Combat Zone).

- (1) Highway tonnage capability.^{2 3}

Dirt ----- 1,600 short tons/day fwd

Gravel ----- 3,400 short tons/day fwd

Bituminous 5,800 short tons/day fwd treated.

Bituminous ---- 7,300 short tons/day fwd

Concrete ----- 8,400 short tons/day fwd

- (2) A hard-surface, two-lane road of high-type asphalt, macadam, or equivalent will support a corps of four or five divisions.

- (3) Trucks required to move the foot troops of an infantry division—219 vehicles less any available vehicles from the infantry division supply and transport battalion.

¹ For planning purposes, new carload (payload) is computed at 50 percent of its rated capacity. U. S. equipment overseas box, gondolas, and flatcars, 40 tons rated capacity (standard gage); 30 tons rated capacity (narrow gage).

² No exact formula has been developed for determining the capabilities of various types of roads and highways because of many various factors which must be considered. These capabilities are based on the following assumptions:

a. Operation is sustained.

b. Necessary road maintenance is performed.

c. Each road bears two lanes of traffic, permitting movement in both directions.

d. Standard cargo trucks, 2 $\frac{1}{2}$ -ton, 6 x 6, are used.

e. Two-thirds of the capability of the road is used for civil and/or other military traffic normal to a theater of operations.

³ Reductions for width, alignment, and weather have not been applied. See paragraph 7-14.

- (4) A transportation light truck company (TOE 55-17) at full strength, equipped with 2 $\frac{1}{2}$ -ton, 6 x 6 cargo

trucks, with 45 available vehicles making four round trips per day, can transport in local hauls 720 short tons of cargo (4 tons per truck) on highway, or 3,600 passengers (20 passengers per truck) on or off highway. In line hauls, with 45 trucks available making two round trips per day (one per 10-hour shift) it can transport 360 short tons of cargo (4 tons per truck) on highway, or 1,440 passengers (16 per truck) on or off highway. In one lift, off highway, with 45 trucks available it can transport 112.5 short tons of cargo (2 $\frac{1}{2}$ tons per truck).

- (5) A transportation light truck company (TOE 55-17) at full strength, equipped with 5-ton 6 x 6 cargo trucks, with 45 available vehicles making four round trips per day, can transport in local hauls 1,080 short tons of cargo (6 tons per truck) or 3,600 passengers (20 passengers per truck) on or off highway. In line haul with 45 available trucks making two round trips per day (one per 10-hour shift) it can transport 540 short tons of cargo (6 tons per truck) on highway or 1,620 passengers (18 per truck) on or off highway. In one lift, off highway, with 45 trucks available it can transport 225 short tons of cargo (5 tons per truck).

g. Pipelines. For pipeline transfer and movement capabilities, see TM 5-343.

h. Air Transportation. For data pertaining to the determination of aircraft requirements to transport the Army divisions, or organic units thereof, by air, see TM 57-210, FM 57-100 and FM 61-100.

Section II. TERMINALS

7-5. General

a. Types. A terminal is a military or commercial facility used for the loading, unloading, and intransit handling of cargo or personnel by any of the various modes of transportation.

Normally terminals will also contain other facilities essential in the operation of the mode, such as maintenance facilities classification yards, dock and lighterage facilities; management offices; storage facilities; and freight and passenger loading and unloading facilities as

required. The three types of terminal treated in this section are—

- (1) Water terminals.
 - (a) Ports.
 - (b) Beaches
- (2) Inland terminals.
- (3) Air terminals.

b. *Elements of Terminal Planning.* There are normally five steps in terminal planning:

- (1) *Step 1.* Computation of the terminal workload required to support the operation, expressed as cargo tonnage and number of personnel per day.
- (2) *Step 2.* Estimation of the existing terminal capacity, which is the total tonnage and personnel that can be *received, processed, and cleared* through the terminal in a day.
- (3) *Step 3.* Estimation of construction requirements, which are the requirements for repair and rehabilitation of existing facilities and construction of new facilities necessary to increase the existing terminal capacity to equal the required terminal workload.
- (4) *Step 4.* Estimation of the equipment requirement, which is the amount of equipment needed to process the required workload through the terminal with the maximum efficiency.
- (5) *Step 5.* Estimation of the personnel requirements, which are the units and individuals needed for administration and operation in processing the required workload through the terminal.

7-6. Water Terminals (Ports)

a. *General.* This paragraph deals with planning data for water terminals in the hands of the enemy, but which are to be opened for operation as soon as cleared. For this reason, data are based on the employment of Army personnel and ships, gear only for the unloading of ships. Appropriate allowances should be made for other circumstances, such as availability of civilian labor and terminal facilities; i.e., gantry cranes, barges, railway, etc. Discharge of

dry cargo from ships will be accomplished by one of two methods—either from vessels alongside a wharf onto the wharf or by lighters from a vessel anchored astream. Petroleum tankers will be discharged at wharfside or offshore by means of submarine pipelines. Throughout the discussion of water terminals in this paragraph, the basic period of time is a 20-hour day. This is generally considered to be a complete round-the-clock working day in terminal operations, the other 4 hours of the day being taken up in delays inherent in the work, such as breakdowns, waiting for trucks, changing shifts, and meals. (For planning of terminal discharge in forward areas when enemy action may be expected to cause work delays, 15 hours' working time per day may be estimated. Factors used may be reduced proportionately.) For general planning purposes, the transportation terminal service company is considered capable of discharging 720 short tons per 20-hour working day.

b. *Water Terminal Capacity Estimation.*

- (1) *Factors.* Terminal throughput capacity is determined by three major factors. Each of the three factors may be expressed in terms of short tons per day for planning and estimating purposes. All three factors should be accurately estimated even though the limiting factor may be obvious. These estimates will serve to indicate the facilities where improvement effort will yield the greatest return in terms of tonnage movement capability. The three major factors are—
 - (a) Terminal reception capacity; that is, the ability to move ships into a harbor or coastal area and accommodate them for discharge. This capacity is an estimated tonnage which can be discharged daily from ships and is based solely on an evaluation of the physical facilities of the terminal.
 - (b) Terminal discharge capacity; that is, the ability to discharge ships. This capacity is based on the equipment and terminal service units available.

(c) Terminal clearance capacity; that is, the ability to accomplish terminal clearance. This capacity is based on

the transportation available for the movement of supplies from the terminal to depots or consumers.

(2) Checklist for water terminal capacity estimation.

Collect and evaluate these data		Compute these factors	Determine this figure
1 Channel depths -----	(a) Evaluate to determine:	A. Water terminal reception capacity. ¹	Water terminal throughput capacity.
2 Obstructions -----			
3 Enemy air activity -----			
4 Enemy surface activity -----			
5 Enemy submarine activity -----			
6 Climate -----			
7 Weather -----			
8 Minefields or contaminated areas -----			
9 Our own capabilities in combating obstacles. -----			
1 Tactical dispersion requirements -----	(b) Evaluate to determine:	B. Water terminal discharge (input) capacity.	Water terminal throughput capacity.
2 Wharf facilities -----			
3 Beach capabilities -----			
4 Discharge rates ashore -----			
5 Discharge rates astream -----			
6 Anchorage area -----			
7 Extent of destruction or contamination -----			
8 Climate and seasons -----			
9 Weather and tide characteristics -----			
10 Cargo-handling equipment available -----	(c) Add to determine:	C. Water terminal clearance (output) capacity.	Water terminal throughput capacity.
11 Floating craft and equipment available -----			
12 Transit sheds and areas -----			
13 Availability of indigenous labor -----			
14 Space reserved for local economy -----			
15 Enemy activity -----			
1 Capacity of rail facilities -----	(c) Add to determine:	C. Water terminal clearance (output) capacity.	Water terminal throughput capacity.
2 Capacity of highway facilities -----			
3 Capacity of inland waterway facilities -----			
4 Capacity of pipeline facilities -----			
5 Capacity of air facilities -----			
6 Enemy activity -----			

¹ To determine terminal reception capacity, (A above), collect and evaluate data items 1-9 plus data items, 1,6,7,9,14, and 15 of B above. When wharf and beach facilities are used for the physical

accommodation of ships data items 2 and 3 of B above should also be considered.

- (a) These data will probably be obtained from Navy sources; also see paragraphs 7-47 through 7-54.
- (b) For information on beaches, see paragraph 7-7.
- (c) Capabilities of transport services—pipeline, inland waterway, rail, highway, air transport—are indicated in paragraphs 7-10 through 7-26, and 7-40 through 7-46.

c. Wharf Facilities.

- (1) General. Since only two methods of dry cargo discharge are available (a

above), general planning must consider wharf facilities for alongside and lighter discharge. The Victory-type ship having five hatches is used as a basis for all discharge. It was selected since it so closely meets the average characteristics of a nominal ship. Deep-draft wharfage must be provided whenever *alongside* discharge is contemplated. Shallow-draft wharfage and anchorage areas must be given joint consideration when lighter discharge is contemplated. Factors governing wharfage will be

found in (2) and (3) below. The term *wharf* is used throughout in its general meaning; i.e., a structure used to aid in the berthing, loading, and discharge of a vessel. Specific definitions of ship berthing facilities are as follows:

- (a) *Wharf*. A wharf is a projecting platform of timber, stone, or other material which extends into water deep enough for vessels to be accommodated alongside for loading or unloading.
 - (b) *Quay*. A quay is a wharf parallel with the shoreline of a basin or harbor with water and accommodations for ships on one side only.
 - (c) *Pier*. A pier is a wharf which projects into the harbor or basin with water and accommodations for ships on both sides.
- (2) *Deep-draft wharf requirements*. A wharf is classified as deep-draft when the water alongside is deep enough to permit a fully loaded ship to tie up alongside. The following criteria will govern:
- (a) *Water depth*. Water depth should be not less than 10 meters at low tide. A minimum of 10 meters is used for planning purposes since this will accommodate virtually all deep-draft vessels.
 - (b) *Length for Victory-type ship 150 meters*. Each hatch (five per vessel) will require 30 meters of wharf. When wharfs are over 150 meters long and less than the next higher 150 meters unit, the odd footage is disregarded in determining the number of berths available (that is 360 meters will accommodate only two ships at the same time). However, the extra 60 meters can be considered for lighterage use (3) below.
 - (c) *Width*. Width should be 18 to 27 meters for discharge on 1 side of wharf only; 27 meters and up for

discharge on both sides of wharf. For planning and estimating purposes, a wharf should be 18 to 27 meters wide to allow sufficient working space to discharge cargo from a ship. In the case of a pier where two vessels can tie up at the same time, one on each side, it is recommended that the width be 27 meters or more for efficient discharge.

(3) *Lighterage wharf requirements*.

- (a) *General*. Any wharf may be used for lighter discharge if the water depth is sufficient for the type of lighterage being used. It may include wharfage that dries out at low tide but which can be used half the time, or 10 hours per day.
- (b) *Length for lighter*. Wharfage length for a lighter should be 30 meters. Length of wharfage over 30 meters and less than the next higher 30 meters unit is disregarded (that is, a 110 meter wharf will handle three lighters at the same time).
- (c) *Width*. A minimum of 10 meters is recommended for discharge on one side; 13 meters for discharge on both side of pier.

d. *Discharge Rates*.

- (1) *Per ship berth (Victory-type)*. Seven hundred twenty short tons per 20-hour day (five hatches at 7.2 short tons per hatch per hour).
- (2) *Per lighter berth*. One hundred eighty short tons per 20-hour day (1.8 short tons per linear foot or 5.9 tons per linear meter of wharf per 20-hour day).
- (3) *Per roll-on/roll-off berth (Comet-type)*. One thousand short tons of cargo loaded in semitrailers per hour.

e. *Anchorage Areas*. Anchorage areas are defined as shelter areas inside or near a harbor, unaffected by swell, where ships may anchor and discharge by lighter.

- (1) *Depth*. Minimum 10 meters; maximum 65 meters. The minimum depth

is dictated by the draft of the ship, and the maximum by the length and weight of the anchor chain. Installed facilities, such as mooring buoys, may modify maximum depth limitations.

- (2) *Free-swinging anchorage area.* 245 meters radius circle.
- (3) *Moored bow and stern.* Variable; this method is not preferred since it can be used only in areas unaffected by tidal currents.

f. Estimate of Water Terminal Operating Personnel and Equipment.

- (1) *General.* To insure maximum efficiency in terminal operations, a balanced operating force and suitable equipment must be available. Extreme care must be exercised during both the planning phase and actual operating phase to insure that a balance is established and maintained. The possibility of using civilian and prisoner of war labor should not be overlooked, particularly in later expansion of the water terminal.
- (2) *Operating personnel.* Operating personnel are divided into managing, or supervisory, elements (such as headquarters and headquarters company, terminal commands A, B, or C) and functional operating units. In this last category may be included terminal service companies or battalions, truck companies, engineer units, harbor craft units, and such other units particularly suited for the functioning of any particular water terminal. Units commonly found in a water terminal are listed below:

Headquarters and headquarters company, transportation terminal command C (TOE 55-111).

Headquarters and headquarters company, transportation terminal command B (TOE 55-121).

Headquarters and headquarters company, transportation terminal command A (TOE 55-131).

Headquarters and headquarters detachment, transportation battalion (TOE 55-116).

Transportation terminal service company (TOE 55-117).

Transportation medium boat company (TOE 55-128).

Transportation heavy boat company (TOE 55-129).

Transportation amphibian maintenance (DS) detachment team BA (TOE 55-510).

Transportation amphibian GS company (TOE 55-158).

Transportation light amphibian company (TOE 55-138).

Transportation floating craft depot maintenance company (TOE 55-157).

Headquarters and headquarters detachment, transportation truck battalion (TOE 55-16).

Transportation light truck company (TOE 55-17).

Transportation medium truck company (TOE 55-18).

Transportation heavy truck company (TOE 55-28).

Transportation terminal transfer company (TOE 55-118).

Transportation heavy amphibian company (TOE 55-140).

Floating craft crews (TOE 55-500).

Transportation medium amphibian company (TOE 55-139).

Transportation staging area company (TOE 55-147).

Military police battalion (TOE 19-55).

Engineer utilities team (TOE 5-500).

Engineer firefighting team (TOE 5-500).

Finance disbursing section (TOE 14-500).

Medical dispensary team (TOE 8-500).

Veterinary food inspection detachment (small) (TOE 8-500).

Quartermaster service company (TOE 10-67).

Signal service team (TOE 11-500).

Army postal unit (TOE 12-605).

Ordnance ammunition team (TOE 9-500).

g. Operating Equipment. Details of operation and capacity of terminal operating equipment, can be found in the following references:

FM 55-51, *Transportation Terminal Commands, Theater of Operations.*

FM 55-52, *Transportation Terminal Battalion and Terminal Service Company.*

FM 55-56, *Transportation Terminal Transfer Company.*

FM 55-57, *Transportation Harbor Craft Units and Marine Maintenance Units.*

FM 55-58, *Transportation Boat Operations.*

h. Illustrative Example of Water Terminal Capacity Estimation. The following example has been provided to demonstrate the recommended procedure for water terminal capacity estimation based on the steps and data outlined in the preceding paragraphs.

- (1) *Situation.* A true-scale chart (fig. 7-1) of a certain harbor has been prepared for evaluation. With reference to this chart, the following additional information has been assembled:

1	2	3	4
Wharf No.	Length (meters)	Width (meters)	Minimum depth alongside at low tide (meters)
1 -----	323	24.	10.
2 -----	149	18.	9.
3 -----	177	27.	9.
4 -----	163	31.	10. (ea side)
5 -----	38	17.	2.5
6 -----	90	18.	4.5
7 -----	137	23.	7.
8 -----	64	18.	5.

- (a) There is sufficient area inside the harbor to anchor three ships as shown, where they can be worked continuously.

- (b) In good weather, as many as two vessels can be anchored and worked outside the breakwater.

- (2) *Problem.* To estimate the daily capacity of this terminal during ideal weather.

- (3) *Solution.*

- (a) *Discharge tonnage at deep-draft wharfage.*

1	2	3
Wharf No.	Vessel which can be berthed	Rate of discharge in short tons per day
1 -----	2 Victorys	$2 \times 720 = 1,440$
2 -----	1 Victory	$1 \times 720 = 720$
3 -----	1 Victory	$1 \times 720 = 720$
4 -----	2 Victorys	$2 \times 720 = 1,440$
Total -----		4,320

- (b) *Discharge tonnage to lighterage wharfs.*

1	2	3
Wharf No.	Lighter berths	Rate of discharge in short tons per day
5 -----	1	$1 \times 180 = 180$
6 -----	3	$3 \times 180 = 540$
7 -----	4	$4 \times 180 = 720$
8 -----	2	$2 \times 180 = 360$
Total -----		1,800

- (c) *Rate of discharge from ships at anchor to lighters.* From the situation, three ships can be anchored inside the breakwater and two can be anchored and worked outside the breakwater in good weather. Therefore, in good weather, cargo can be discharged from ships to lighters at the rate of $(3+2) \times 720 = 3,600$ short tons per day.

- (d) *Resultant daily terminal capacity—summary.*

1. Discharged alongside deep-draft wharfs—4,320 short tons per day.
2. Discharged from lighters to wharf—1,800 short tons per day.
3. Transferred from ships to lighters—3,600 short tons per day.
4. Therefore: 1,800 short tons per day is maximum discharge by lighter since lighter wharfage is the limiting factor in this case.
5. Total daily terminal capacity: 4,320 short tons per day alongside. 1,800 short tons per day by lighter.

Total 6,120 short tons per day.

- (e) *Limitations on terminal capacity.* Requirements for dispersion and limitations on the number of ships which can be grouped in one area may restrict the use of the facility to much less than its full capacity.

- (4) *Effects of bad weather.* Advance study must be made to determine the probable effect of bad weather on rate of discharge and other factors in water terminal capacity. Continuous records

of daily discharge plotted against weather and surf conditions prove valuable in planning future discharge in the same and similar water terminals.

- (5) *Operating personnel and equipment.* Note that appropriate amounts of operating personnel and equipment must be provided to use the capacities of the physical facilities of the terminal.

7-7. Water Terminals (Beaches)

a. Amphibious Operations.

(1) *Beach capacity.*

- (a) Each landing in an amphibious operation differs as to climatic and hydrographic conditions and variations in topographic features, as well as in the military situation. These variable factors make it impracticable to develop detailed logistical planning data applicable only to beaches and their capacity to receive troops and cargo. However, certain general planning data can be developed.
- (b) Beach capacity is an evaluation of cargo quantities than can be discharged over a given lineal beach length within a stated interval of time. During the initial phases of an amphibious operation, beach capacity will be limited to the beach (or beaches) over which the assault landing is made; later, if necessary, overall capacity may be increased by the consolidation of beaches for more efficient operation and for the opening of sheltered unloading points in rivers or bays. Experience has indicated that, during the *assault* phase of an operation, cargo can be landed and moved across beaches as follows (use either 1 or

2 or 1 and 2 together in proportionate combination):

1. Average short tons of cargo per day per kilometer of beach ---1,860
2. Average numbers of vehicles and personnel landed simultaneously per day per kilometer of beach:

Vehicles ----- 420

Personnel ----- 2,930

(2) *Requirements for ship unloading.*

Facilities for unloading ships offshore are usually limited to the ships' organic gear. Using organic ships' gear, stevedore labor, and lighterage provided by the task force, cargo is discharged at a prescribed rate in planned sequence. The use of balanced amounts of conventional and amphibious ship-to-shore lighterage, combined with planned and controlled ship-discharge, will reduce beach congestion to a minimum.

(3) *Characteristics of amphibious force vessels and craft.*

- (a) Data contained in this paragraph with reference to speed and endurance may vary under operational conditions.
- (b) Designating letters and names are used in the following general manner:
1. LC (landing craft) is applied to nonocean-going vessels of less than 60 meters overall length designed for landing operations.
 2. LS (landing ship) is applied to ocean-going vessels of more than 60 meters overall length designed for participation in landing operations.
 3. LV (landing vehicle) is applied to small equipment designed for landing operations and capable of use on land or water.

(c) Characteristics of small landing craft.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Name	Symbol	Length	Beam	Capacity		Draft (loaded)		Speed, loaded (knots)	Range (miles)	Crew	Weight (LTONS) empty	Cargo space dimensions
					Troop	Cargo (LTONS)	Forward	Aft					
2	Landing craft, vehicle, personnel.	LCVP	36'0"	10'5"	36 or	3.5	2'2"	3'0"	10.5	135	4	8	17'3" x 7'5" x 5'
3	Landing craft, mechanized (Mark VI).	LCM(6)	56'0"	14'0"	120 or	32.0	3'0"	4'8"	8.0	128 at 8 knots	4	28	37'6" x 11'0" x 6'4"
4	Landing craft, mechanized (Mark VIII).	LCM(8)	73'8"	21'0"	200 or	53.5	3'0"	5'0"	10.0	284	6	60	42' x 14'6" x 3'8"
5	Landing craft, utility (1466 class).	LCU	115'1"	34'0"	300 or	135.0	3'1"	4'0"	7.0	700	12	180	52' x 26'9" x 4'6" plus 22' x 14'4" x 4'6"
6	Landing craft, utility (1610 class).	LCU	135'3"	29'0"	400 or	170.0	3'3"	6'6"	11.0	-----	12	174	27' x 27' x 4'6" plus 53' x 18' x 4'6" plus 14' x 20' x 4'6" plus 11' x 13' x 4'6"

(d) Characteristics of amphibious vehicles.

	1	2	3	4	5	6	7			8			9	10	11
1	Name	Symbol	Length	Beam	Capacity		Speed			Range			Crew	Weight (LTONS) Empty	Example of material carried
					Troop	Cargo (LTONS)	Land		Water	Land		Water			
							MPH	kmPH	Knots	Miles	Km	Nautical miles			
2	Carrier, cargo, amphibious, full-tracked.	M76	15'7"	8'2"	10	15.0	28	45	3.4	160	258	24.6	2	4.3	10 passengers (including crew).
3	Landing vehicle, tracked, engineer, model 1.	LVTE-1	39'9¼"	12'8½"	-----	-----	24.9	40	5.4	185	298	120	8	36.9	None
4	Landing vehicle, tracked, recovery, model 1.	LVTR-1	31'9"	11'8½"	-----	-----	30	48	6.0	220	354	50	3	33.5	600 cubic feet available w/recovery equipment removed from cargo compartment.
5	Landing vehicle, tracked, (MARK V).	LVTP-5	29'8"	11'8½"	34	9L 6W	27.8	45	6.7	187	301	45	3	31.2	105-mm Howitzer W crew and 100 rd ammo.
6	Landing vehicle, tracked,	LVT(A)-5	27'2½"	10'10"	-----	-----	20	32	5.6	150	242	50	5	15.7	None
7	Landing vehicle, tracked, (MARK VI).	LVTH-6	29'8"	11'8½"	-----	-----	27.8	45	6.7	187	301	45	6	37.8	None
8	Landing vehicle, tracked, (MARK VI).	LVTP-6	21'7"	10'9"	20	5L 4W	35	56	5.5	190	306	45	3	17.9	Bulk cargo
9	Lighter, amphibious, wheeled, (LARC-5).	LARC-5	35'0"	10'0"	24	4.4 (emerg)	30	48	8.7	400	644	50	3	8.5	Unitized general cargo
10	Lighter, amphibious, wheeled, (LARC-15).	LARC-15	45'0"	14'6"	52	13.2 (emerg)	30	48	8.7	315	507	90	3	18.8	Unitized general cargo
11	Lighter, amphibious, wheeled, (LARC-60).	LARC-60	62'6¾"	26'7"	125	53.6 (normal) 200 89.3 (emerg)	14	23	6.1	300	483	150	4	87.0	Personnel and large, heavy, bulky, out-sized equipment.

Note. No consideration need be made for the draft of amphibious vehicles. However, consideration must be given to the characteristics of the landing area which may affect beaching, such as mud, coral, or rock formations.

(e) Characteristics of landing ships.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Name	Number ships in class	Type	Operational range (nautical miles)	Cargo capacity (LTONS)	Troop capacity ¹	Cargo space (sq ft)	Loaded draft		Length	Boat capacity	Typical loads
								Beaching	Oceangoing			
2	LSD (1)	26	Flooded well deck.	13,000	1,233	226	17,316	27'0" (flooded)	18'0" dry	458'0"	2LCVP and 1 LCPL	3 LCU and 4-5 med trk; or 18 LCM(6) and 30 LTON cargo; or 41 LVT; or 27 LCVP; or 44 M48 tk.
3	LSD (28)	1	Flooded well deck.	13,000	2,410	353	19,800	30'0" (flooded)	19'0" dry	510'0"	3 LCVP and 1 LCPL	(With two temporary decks W ramps) 92 LVT
4	LSD (32)	4	Flooded well deck.	9,500	2,500 in addition to rated well deck load.	313	* 24,792	33'9" (flooded)	19'0" dry	510'10"	3 LCVP and 1 LCPL	3 LCU; or 20 LCM(6); or 9 LCM(8); or 49 LVTP-5; or 87 LVTP-6.
5	LST (1156)	15	Ramp, 50-ton capacity.	6,000	Normal—446; Maximum landing—803; Full—1,395	395	14,000 (vehicles) 16,500 (cargo)	4'11" fwd 10'8" aft	8'3" fwd	382'0"	3 LCVP and 1 LCPL	80 2½-ton trk, 450 LTON cargo; or 144 ¾-ton trk, 415 LTON cargo; or 233 ½-ton trk, 530 LTON cargo; or 25 LARC-5, 445 LTON cargo.
6	LST (1153)	2	Steamdriven; ramp, 50-ton capacity.	7,700	Normal—446; Maximum landing—803; Full—2,060	197	14,340	3'11" fwd 11'11" aft	9'6" fwd 16'3" aft	382'0"	4 LCVP or 4 LCPR	21 LVT and 35 2½-ton trk; or 25 LARC-5; or 226,000 gal gasoline and 70,000 gal diesel fuel.
7	LST (542)	148	Ramp, 50-ton capacity.	7,706	Normal—446; Maximum beaching—803; Full—1,212	141	4,556 (vehicles). 9,772 (cargo)	5'3" fwd 10'2" aft	7'2" fwd 13'0" aft	328'0"	4 LCVP or 4 LCPR	26 2½-ton trk, 650 LTON cargo or 45 ¾-ton trk, 675 LTON cargo; or 75 ¼-ton trk, 710 LTON cargo or 23 LARC-5
8	LST (1171)	8	Ramp, 75-ton capacity (equipped with turntable).	6,048	Normal—500 Maximum landing—900; Full—1,850	634	18,313	4'0" fwd 13'0" aft	9'9" fwd 16'0" aft	442'0"	3 LCVP and 1 LCPL	19 LVTP-5 and CH-19 hel; or 27 LVTP-6 and 5 CH-19 hel; or 69 2½-ton trk; or 42 2½-ton trk W 1½-ton tlr; or 42 M48 tk.
9	LSM	136	Ramp, open well.	10,000	Landing—147; Full—446	56	2,900	3'6" fwd 7'1" aft	4½" fwd 8'5" aft	204'0"	-----	3 M48 tanks; or 5 LVT

¹ Troop capacity may be increased by berthing troops on decks. Troops must provide own feeding facilities.

² Add 6,386 sq ft with mezzanine deck installed.

Note 1. A boat space is the space weight allowed one soldier with his individual combat equipment. It is 224 pounds or 13.5 cubic feet. When computing boat spaces required for cargo, use either the weight or the space occupied, whichever is greater. Hand carts, loaded or empty, require two boat spaces.

Note 2. Running time may be computed from the formula $T = \frac{3D}{S}$ when $D =$ Distance run in hundreds of yards.
 $S =$ Speed in knots ($1\frac{1}{2}$ MPH).
 $T =$ Running time in minutes.

(f) Characteristics of transport-type vessels.

	1	2	3	4	5	6	7	8	9	10	11
	Name	Nr ships in class	Class	Type	Length	Loaded draft	Troop capacity	Cargo capacity (LTON)	Cargo space	Boat capacity	Cruising range (nautical miles)
1											
2	Amphibious force flagship (AGC).	16	-----	C-2	459'	24'0"	-----	-----	-----	2 LCVP 4 LCPL 2 LCPR	30,000
3	Attack transport (APA 117).	57	Haskell	-----	455'	24'0"	1,565	446.0	13,000 sq ft 110,000 cu ft	2 LCM(6) 22 LCVP 1 LCPL 1 LCPR	9,800
4	Attack transport (APA 33).	6	Bayfield	-----	492'	27'0"	1,647	446.0	15,000 sq ft 160,000 cu ft	4 LCM(6) 18 LCVP 3 LCPL 2 LCPR	11,630
5	Attack cargo ship (AKA).	35	Montague	C-2A	459'	24'0"	212	1,335.0-1,600.0	31,858 sq ft 291,706 cu ft	6 LCM(6) 14 LCVP 1 LCPL 1 LCPR 2 LCM(3)	12,000
6	High-speed transport (APD).	21	-----	EX-DDE	306'	13'0"	156	45.0	3,730 cu ft	2 LCVP 2 LCPR or 2 LCPL	5,100
7	Transport submarine (A-SSP).	2	Sea Lion	-----	312'	-----	85	26.7	-----	20 rubber landing craft.	-----
8	Roll-on/roll-off vehicle ship (T-AK).	1	Comet	C-4	449'	22'0"	-----	4,000.0 (375 veh)	60,000 sq ft parking space and 176,500 cu ft cargo space.	-----	13,000
9	Amphibious assault ship (LPH)	13	-----	EX-CVE	88'	28'9¼"	1,500	-----	-----	-----	16,000

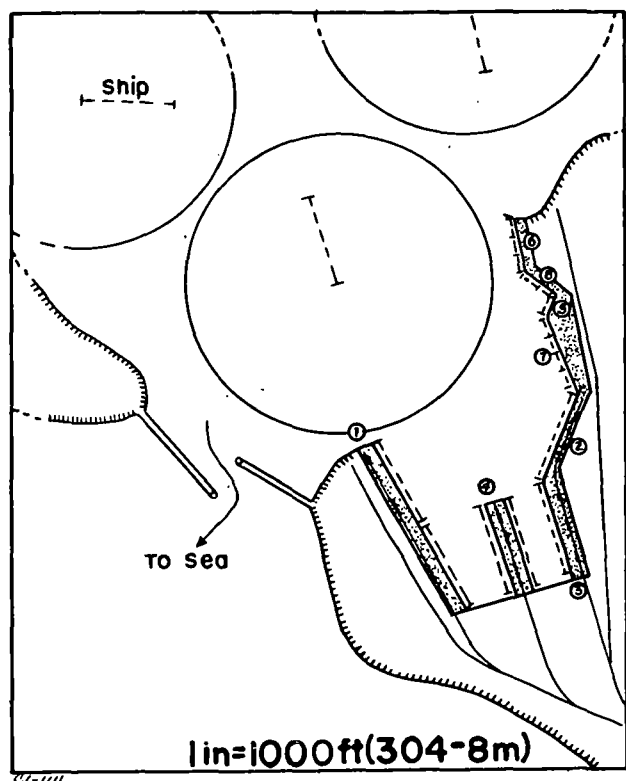


Figure 7-1

- (4) *Cargo movement by wheeled amphibians.* In amphibious operations, wheeled amphibians are specialized equipment of exceptional value which enable direct movement of cargo from ships to shore-based dumps or transfer points.
- (5) *Equipment required for operation on the beach, for beach clearance, and for operations in shore-based dumps.* World War II experience consistently showed a lack of sufficient shore-based equipment to receive cargo as rapidly as unloading from ships could be effected. Resulting bottlenecks at beaches and at beach dumps could have been avoided had additional cargo-handling equipment, particularly cranes, been available. It was found that cargo-handling equipment best adapted to beach and shore dump employment included cranes, tractors,

and trucks. Detailed characteristics of these items are outlined below.

- (a) Cranes should be self-propelled, of medium and heavy types, with booms 40 feet in length to permit lifting filled cargo nets. Each crane can handle discharge from 3 LCU's; or 8 LCM's, or 12 LCVP's under normal beach operations when sufficient trucks or tractors are available to haul or drag away unloaded cargo.
- (b) Medium and heavy tractors, can tow up to nine loaded sled pallets. This type of movement from beach to dump is slow and less satisfactory than movement by truck. However, for dragging pallets from landing craft and within supply dumps, tractors are effective. Tractors are invaluable for clearing the beach and dump areas of mired vehicles. Eight to 10 tractors per assault division, 6 to 7 on beaches, and 2 to 3 in supply dumps are usually sufficient. Several tractors assigned to a beach should be equipped with angledozers.

- (c) See paragraphs 7-10 through 7-13 regarding trucks.

- (6) *Beach service troop requirements.* Service troops are employed throughout the supply-service cycle from ship unloading to segregation and storage of supplies in shore-based dumps. The multiple functions performed in this cycle require that care be exercised in balancing the type of troops employed, since a breakdown in service troops' functioning will render available equipment partially or completely ineffective.

b. Logistics — Over-the-Shore Operations (LOTS).

- (1) *General.* A LOTS operation provides, in situations other than amphibious operations, for the movement of cargo across the shore between ocean transportation and shoreside facilities.

Beaches and other more difficult shoreline will be utilized during this type of operation to the extent required by the situation.

- (2) *Beach capacity estimation.* The check list contained in paragraph 7-6b(2) may be used to assist in determining the beach capacity. Certain of these factors are not primary considerations, and others must be greatly expanded according to the location under study, which will determine the weight to be given each individual factor. The following items must be investigated thoroughly to determine their effect on the operation:
 - (a) Weather—wind, fog, rainfall, temperature.
 - (b) Sea area—extent, depth of water, type bottom, vulnerability to sea-wave action.
 - (c) Beach approaches — reefs, bars, manmade obstacles, tide, type of bottom, surf conditions, underwater gradient.
 - (d) Beach — gradient, composition, length, width, wave effect, exits.
 - (e) Hinterland — depth, concealment, transportation net capability.
- (3) *Operating equipment.* The same materials-handling functions are per-

formed as in a conventional port situation but there is a greater requirement for cranes, and forklift trucks that can traverse sand and soft terrain. Amphibians should be used to relieve congestion at the water's edge and eliminate unnecessary handling of cargo.

7-8. Inland Terminals

a. Definition. Inland terminals are defined as those inland transit points where cargo is—

- (1) Temporarily held intransit awaiting disposition instructions.
- (2) Transferred from one means of transportation to another.
- (3) Broken down from bulk shipments and reshipped in small units.
- (4) Collected from other points to make a transportation unit for reshipment.

b. Capacity Estimation. Inland terminal capacity is the total tonnage that can be *received*, *processed*, and *cleared* through the terminal in any 1 day. The terminal capacity is estimated by analyzing three major factors—reception capacity, loading and unloading or transfer capacity, and clearance capacity—to ascertain which is the limiting factor, and then determining its value as expressed in daily tonnage. The following is a checklist for estimation of inland terminal capacity:

Collect these data when applicable

- | | | | |
|----|---|---|---|
| 1 | Channel depths ----- | } | |
| 2 | Obstructions ----- | | |
| 3 | Capacity of rail facilities ----- | | |
| 4 | Capacity of highway facilities ----- | | |
| 5 | Capacity of pipeline facilities ----- | | |
| 6 | Capacity of air facilities ----- | | |
| 7 | Enemy air activity ----- | | |
| 8 | Enemy surface activity ----- | | |
| 9 | Climate ----- | | |
| 10 | Weather ----- | | |
| 11 | Contaminated areas ----- | | |
| 12 | Our own capabilities in combating obstacles ----- | | |
| 1 | Tactical dispersion requirements ----- | } | |
| 2 | Wharf and/or platform facilities ----- | | |
| 3 | Discharge rates ----- | | |
| 4 | Unloading rates ----- | | |
| 5 | Loading rates ----- | | |
| 6 | Extent of destruction or contamination ----- | | |
| 7 | Climate and seasons ----- | | |
| 8 | Weather and tide characteristics ----- | | |
| 9 | Materials handling equipment available ----- | | |
| 10 | Cargo handling equipment available ----- | | |
| 11 | Floating craft and equipment available ----- | | |
| 12 | Airfield capabilities ----- | | |
| 13 | Transit sheds, yards, and areas ----- | } | |
| 14 | Indigenous labor available ----- | | |
| 15 | Space reserved for local economy ----- | | |
| 1 | Capacity of rail facilities ----- | | } |
| 2 | Capacity of highway facilities ----- | | |
| 3 | Capacity of inland waterway facilities ----- | | |
| 4 | Capacity of pipeline facilities ----- | | |
| 5 | Capacity of air facilities ----- | | |

Compute these factors

Determine

- (1) Evaluate to determine:
A. Inland terminal reception capacity.

- (2) Evaluate to determine:
B. Loading and/or unloading or transfer capacity.

- (3) Add to determine:
C. Clearance capacity.

Inland terminal capacity.

c. Estimation of Equipment. Equipment requirements are determined by analyzing the projected workload of the inland terminal in relation to the tonnages and types of cargo to be unloaded, loaded, and transferred. See paragraph 76g for planning data on cargo-handling equipment.

d. Estimation of Personnel Requirements. Personnel requirements are determined by evaluating the mission of the inland terminal in terms of workload, equipment to be manned, and services to be performed. To insure maximum efficiency in terminal operation, a balanced force and supervisory elements must be available. The use of indigenous and prisoner-of-war labor should be considered.

7-9. Air Terminals

a. General. Air terminals provide facilities

for loading and unloading aircraft and for in-transit handling of personnel and cargo which are moved by aircraft.

b. Responsibilities.

- (1) *Air Force.* Selection, preparation, and operation of air terminals, exclusive of airfields or landing areas operated by and for Army aviation units.
- (2) *Army.* Engineer service support of air terminals, to include construction and maintenance other than repairs and utilities.

c. Operations.

- (1) *General.* The theater air force provides aerial port squadrons to operate air terminals. Theater army may establish facilities and station personnel at an air terminal in a tenant status to perform those functions agreed

upon by the theater army and theater air commanders.

- (2) *Aerial port squadrons.* An aerial port squadron is a cellular-type Air Force organization. Its utilization and its strength are determined by the assigned mission. These units provide passenger and cargo-handling capabilities, to include manifesting, warehousing, loading, unloading, tiedown, preparation for aerial delivery, and ejection in flight. One aerial port squadron is capable of performing any one of the following tasks:
 - (a) Handling 480 tons of cargo per 8-hour day in an air-landed operation.
 - (b) Rigging for delivery by parachute and loading 280 tons of cargo per 8-hour day when the packing of parachutes is not required.
 - (c) Rigging for delivery by parachute, packing parachutes, and loading 112 tons per 8-hour day.
- (3) *Army quartermaster aerial supply companies (TOE 10-407).* These units are stationed at selected air terminals or at Army logistical installations to prepare cargo for parachute or free-drop delivery. For capabilities of this company, see TOE 10-407 and FM 101-10-2.
- (4) *Volume.* The volume of cargo and passenger traffic at an Army airfield may require assignment of a unit to perform these operations. Units which may be employed include the quartermaster aerial supply company or teams from TOE 10-500; transportation terminal transfer company (TOE 55-118); or the transportation contract supervision team and the cargo documentation team from TOE 55-500.

d. Airfield Capabilities.

- (1) The following criteria establish the maximum number of aircraft which can be based on an airfield or landing strip. Dispersion requirements may dictate decreased utilization of such facilities.
 - (a) Improved airfields in rear of combat zones can serve as a base for a maximum of two wings. Under ideal conditions, aircraft land or takeoff at 3-minute intervals, and 1 hour on the ground is required for each landing for necessary servicing, reloading, and inspection.
 - (b) Unimproved airfields and landing strips in rear of the combat zone can serve as a base for approximately one wing.
 - (c) Transport aircraft normally will not be based in the combat zone. On airfields in the combat zone, aircraft land or takeoff at 3-minute intervals under ideal conditions, and the time required on the ground is reduced to 30 minutes. Service and maintenance is limited to emergency requirements only, and the tactical situation normally will not permit more time than that required for actual unloading and reloading.
- (2) For transport aircraft use, airfields in rear of the combat zone should be considered operational both day and night. Airfields in the combat zone may be operational only during daylight hours, depending on the enemy air capabilities.
- (3) The capabilities of aerial port squadrons also influence traffic potential of airfields.

Section III. HIGHWAY TRANSPORT

7-10. Motor Transport Operations

a. Operations of motor transport in support of forces in a theater of operations are gen-

erally either local or line hauls. The following categorizations are applicable:

- (1) *Local hauls.* Characterized by low run-

ning time in relation to loading and unloading time. These hauls normally involve a number of trips per day and are evaluated on the basis of tons moved during the operational period. The method of operation predominately used in local hauls is the shuttle or repeated trips made by the same vehicles between two specified points. Port and beach clearance, installation support operations, transfer operations and field support operations are all classes of operation most readily adaptable to local haul.

- (2) *Line hauls*. Characterized by high running time in relation to loading and unloading. These hauls normally involve one trip or a portion of a trip per day. The most common method of operation used in line haul is the relay—the movement of supplies or troops in continuous movement without transfer of load. It is accomplished by a change of truck-tractors or drivers. Intersectional motor transport service requirements are generally accomplished using line haul.

b. Other terms used in conjunction with motor transport operations—

- (1) Direct haul.
- (2) Piggyback (or trailer on flat car (TOFC)).
- (3) Roll-on/Roll-off.
- (4) Highway movement.
- (5) Off-road movement.
- (6) Highway regulation. (The planning, scheduling, routing, and directing the actual use of a military road maneuver network by vehicular and foot traffic.)

c. See FM 55-35 for details of motor transport service in theaters of operations.

7-11. Planning Factors

a. Because of the varied services performed, the different loads carried, and different terrain over which motor transport operations are conducted, planning factors should be used with caution and applied only in the absence

of specific data on the local situation. (For classified motor transport planning factors, see FM 101-10-3, ch. 5, sec. V.)

b. The following factors are used in highway transport planning for computing truck and truck company requirements in the absence of specific data:

- (1) *Vehicle availability* — the average number of task vehicles not in maintenance and therefore available for daily operations out of the total task vehicles assigned to a truck unit.
 - (a) Operational short range—83 percent.
 - (b) Long-range planning—75 percent.
- (2) *Vehicle payload*—the anticipated payload per vehicle (see table A, below). Following are rules of thumb only:
 - (a) Off-road—rated capacity of vehicle.
 - (b) Highway—rated capacity plus 50 percent for trailers or semitrailers and 100 percent for tactical wheeled vehicles.
- (3) *Trips per day*—the daily round trips which a vehicle will average. These will vary with running time and loading and unloading time. Following are general averages only:
 - (a) Line haul—one per day.
 - (b) Local hauls—four per day.
- (4) *Length of haul*—the one-way distance cargo is to be hauled, from which round-trip distance may be computed. Following are rules of thumb only:
 - (a) Line haul: 160 km/100 miles one way.
 - (b) Local haul: 25km/15 miles one way.
- (5) *Rate of movement*—the average number of kilometers or miles covered in an hour, including halts during the period of movement. For long-range planning, the following estimates may be used:
 - (a) Poor roads—16 km/10 miles in the hour
 - (b) Good roads—25 km/15 miles in the hour
- (6) *Turnaround time*—the time consumed in all loading, unloading, and move-

ment from origin to destination and return to origin.

- (7) *Loading and unloading time*—time consumed per turnaround in loading and unloading areas, including time waiting, spotting, documenting, and handling of cargo on and off vehicles. The following are loading and unloading times for loose cargo:

- (a) Straight trucks—2.5 hours per round trip.
 (b) Semitrailers in relay operation—1 hour per relay; 4 hours loading and unloading time per round trip.
 (c) Truck-tractors in relay operations—1 hour per relay.
 (8) *Operational day*—the number of hours

per day in which vehicles with drivers are normally employed.

- (a) One shift (peacetime)—10 hours.
 (b) Round-the-clock (wartime) — 20 hours.
 (9) *Unit lift and daily lift*—unit lift is the amount of cargo a truck unit is expected to move at one time; daily lift is that which it can move in a day with a number of trips. (See table B, part I, below.)
 (10) *Ton-kilometers/miles and Passenger-kilometers/miles*—the product of the number of tons or passengers and the actual distance they were moved. (See table B, part II, below.)

Table A. Vehicle Payload Capacities for General Planning

1	Nomenclature	2 Off-road (tons)	3 Highway average (tons)	4 Highway maximum (tons)	5 Towing capacity (tons)		7 Passen- gers ¹	8 Cargo space
					Highway	Cross- country		
2	Automobile, sedan, lt						² 4	
3	Bus, convertible, 37-passenger						37 or	18 liters.
4	Carrier, lt wpn, inf. ½-ton, 4 x 4	½		½				25 sq ft.
5	Carrier, pers, full-tracked, armd, M59	1½	1½	1½			10	
6	Carrier, pers, full-tracked, armd, M113E2.						11	
7	Stlr, cgo van, 6-ton, 2-wheel, M110	6	9	9			³ 24	1,020 cu ft.
8	Stlr, shop van, 6-ton, 2-wheel, M146	6	8	8				1,675 cu ft.
9	Stlr, stake, 6-ton, 2-wheel, M118	6	9	9			³ 24	1,130 cu ft.
10	Stlr, reifr, 7½-ton, 2-wheel	6	6	7½				790 cu ft.
11	Stlr, cgo, 12-ton, 4-wheel, M127A1	12	12	18			³ 50	384 sq ft.
12	Stlr, low-bed, 12-ton, 25-ft	12	16	18				200 sq ft.
13	Stlr, sup van 12-ton, 4-wheel, M129	12	18	18			³ 50	1,342 cu ft.
14	Stlr, low-bed, 15-ton, 4-wheel, M172	25	16	25				320 sq ft.
15	Stlr, van, 20-ton, 34-ft	20	18	24			³ 65	1,349 cu ft.
16	Stlr, tk transporter, 50-ton, 8-wheel, M15A2.	50	40	50				
17	Stlr, low-bed, 60-ton, 8-wheel, M162	60	60	60				
18	Stlr, tk, gas, 5,000-gal, 4-wheel, M131A2	3,000 gal	5,000 gal	5,000 gal				
19	Tlr, amph, cgo, ¼-ton, 2-wheel	¼	¾	¾				60 cu ft.
20	Tlr, cgo, ¼-ton, 2-wheel	¾	1½	1½				175 cu ft.
21	Tlr, cgo, 1½-ton, 2-wheel	1½	2¼	2¼				283 cu ft.
22	Tlr, ammo, 2-ton, 2-wheel	2	2	3				
23	Trk, amb, frontline, ¼-ton, 4 x 4, M170						⁴ 4 or	3 liters.
24	Trk, util, ¼-ton, 4 x 4	0.4	0.4	0.6	1	¾	²	66 cu ft.
25	Trk, amb, ¼-ton, 4 x 4, M143						³ 8 or	5 liters.
26	Trk, cgo, ¼-ton, 4 x 4	¾	1	1½	2			160 cu ft.
27	Trk, cgo, 2½-ton, 6 x 6	2½	4	5	5	3	20	408 cu ft.
28	Trk, dump, 2½-ton, 6 x 6	2½	4	5	5	3	20	67.5 sq ft.
29	Trk, shop van, 2½-ton, 6 x 6, M220	2½	3½	3½	4	3		

Table A. Vehicle Payload Capacities for General Planning—Continued.

1	Nomenclature	2 Off- road (tons)	3 Highway average (tons)	4 Highway maximum (tons)	5 Towing capacity (tons)		7 Passen- gers ¹	8 Cargo space
					Highway	Cross- country		
30	Trk, shop van, 2½-ton, 6 x 6, M292 -----	2½	2½	2½	4	3	-----	-----
31	Trk, tk, gas, 2½-ton, 6 x 6, M217 -----	2½	2½	2½	-----	-----	-----	-----
32	Trk, tk, water, 2½-ton, 6 x 6, M222 -----	1¾	4¾	4¾	-----	-----	-----	-----
33	Trk, cgo, 5-ton, 6 x 6 (single tires) -----	5	6	7½	15	7½	20	513 cu ft.
34	Trk, cgo, 5-ton 6 x 6 (dual tires) -----	5	6	10	15	7½	20	513 cu ft.
35	Trk, dump, 5-ton, 6 x 6 -----	5	7½	7½	15	7½	*15	135 cu ft.
36	Trk, cgo-prime, mover, 10-ton, 6 x 6, M125.	10	10	15	25	15	-----	496 cu ft.

¹ Based on 18 inches per man. Does not include driver or assistant.² Less individual field equipment.³ Recommended for emergency use only. No troop seats provided.⁴ Not generally used for this type of operation.

Table B. Truck Unit Capability Estimates for Long-Range Planning

I. Local haul—short tons per day (highway)

(Vehicle availability X average tons per vehicle X trips per day.)

Light trk co (2½-ton trks) -----	45 x 4 x 4 =	720 STON/day
Light trk co (5-ton trks) -----	45 x 6 x 4 =	1,080 STON/day
Medium trk co (stlr) -----	45 x 12 x 4 =	2,160 STON/day
Medium trk co (petrl)(stlr) -----	45 x 5000 x 4 =	900,000 GAL/day
Medium trk co (reefer 7½-ton) -----	45 x 6 x 4 =	1,080 STON/day
Heavy trk co (stlr tank transporter) -----	18 x 40 x 4 =	2,880 STON/day

II. Line haul—Short tons per day (highway).

(Vehicle availability X average tons per trip X trips per day.)

Light trk co (2½-ton trks) -----	45 x 4 x 2 =	360 STONS/day
Light trk co (5-ton trks) -----	45 x 6 x 2 =	540 STONS/day
Medium trk co (stlr) -----	45 x 12 x 2 =	1,080 STONS/day
Medium trk co (petrl)(stlr) -----	45 x 5000 x 2 =	450,000 GAL/day
Medium trk co (reefer 7½-ton) -----	45 x 6 x 2 =	540 STONS/day
Heavy trk co (stlr tank transporter) -----	18 x 40 x 2 =	1,440 STON/day

7-12. Computing Truck Unit Requirements

a. The following formulas may be used for highway transport planning:

- (1) *One-lift hauls.* To determine the number of truck companies required to move a given number of tons in one lift, use the following formula:

$$\frac{\text{Tons to be lifted}}{\text{Tons per vehicle} \times \text{vehicle availability per company}} = \text{Truck companies required.}$$

Example: To determine the number of transportation light truck companies required to move 2,700 short tons in one lift:

When: 2,700 = tons to be lifted.
4 = tons per truck, 2½-ton, 6 x 6.

45 = vehicles available per company.

$$\frac{2,700}{4 \times 45} = 15 \text{ transportation light truck companies required}$$

Note. If the number of vehicles required is desired rather than the number of truck companies, omit the vehicle availability factor in the formula.

- (2) *Sustained haul in one continuous operation.* In most operations, there is a continuous flow of supplies forward

from dumps, depots, beaches, or terminals. In such cases, tonnages move forward only, and trucks return for another load. The average turnaround time required by the truck units to complete the round trip must be considered. Turnaround time is computed by dividing the round trip distance by the rate of movement and adding delays. Thus, turnaround time = $2 \times \text{distance}$

$\frac{\text{rate}}{\text{rate}} = \text{delays}$. The applicable formula for sustained operations thus becomes:

$$\frac{\text{Daily tonnage forward} \times \text{turnaround time}}{\text{Tons per vehicle} \times \text{vehicles available per company} \times \text{operating time/day}} = \text{Truck companies required.}$$

Example: To determine the number of transportation medium truck companies equipped with 12-ton cargo semitrailers, required to haul 4,800 short tons per day 240 kilometers from point A to point B, using the semitrailer relay method of operation when:

rate = 20 kilometers in the hour.

delay = 2 hours per round trip.
the turnaround time becomes—

$$\frac{2 \times 240 + 2}{20} = 26 + 6^1 = 32 \text{ hours}$$

To complete the example when:

tons per vehicle = 12

vehicles available per company = 50 (at least two trailers per tractor are assumed)

operating time/day = 20 hours

The formula becomes:

$$\frac{4800 \times 32}{12 \times 50 \times 20} = 12.8 \text{ or } 13 \text{ medium truck companies required.}$$

¹ Relay time (6 hours) computed as: 1 hour required for each relay operation, and a relay is required at each end of a segment of a relay operation. In the problem the distance (240 kilometers) was divided into 3 equal segments of 80 kilometers. Hence, $3 \times 2 = 6$.

b. Similar formulas to those in *a* above can be used to compute requirements for troop movements or for hauling bulk liquid by using the number of persons or gallons, respectively, rather than short tons.

c. Through study and analysis of intelligence reports or the actual survey of road conditions in an area of operations, the highway planner may develop good reason for assuming that the planning factors as shown may be changed. He should, therefore, be in a position to alter his assumptions, computations, and the resulting requirements.

7-13. Highway Tonnage Capabilities

a. In selecting the routes over which cargo is to be hauled, considerations must be given to the capabilities of the roads and bridges to sustain the operation. The gross weight of the heaviest loaded vehicle should not exceed the rated tonnage capacity of the weakest bridge, unless it is determined that such bridge(s) will be strengthened. It is difficult to determine the exact tonnage capabilities of highways for sustained operations because of the number of varying conditions which prevail. Also, the volume of tactical, administrative, and indigenous traffic to be accommodated on supply routes may exceed the number of cargo-hauling vehicles, which further restricts the capabilities of highway transport.

b. The following table may be used as a guide in the absence of more accurate data for estimating the supply support tonnage capabilities of highways under varied conditions, assuming that operations are sustained, adequate road maintenance is provided, and each road bears two-way traffic. In using the table of reductions, when more than one limiting feature is involved, apply the narrow roadway factor first; then to the new capability, apply one of the next three on terrain; and finally, to the latter adjustment, apply the weather factor if the conditions are for a sustained period.

	1	2	3	4	5	6	7	8	9
1	Highway type	Daily tonnage forward			Reductions applicable to various ¹ conditions				
		Optimum dispatch route only (short tons)	Supply traffic communication zone (short tons)	Supply traffic combat zone (short tons)	Narrow roadway (percentage)	Rolling terrain (percentage)	Hilly with curves (percentage)	Mountainous (percentage)	Seasonal bad weather (percentage)
2	Concrete -----	60,000	36,000	8,400	25	10	30	60	20
3	Bituminous -----	45,000	27,000	7,300	25	10	30	60	30
4	Bituminous treated -----	30,000	18,000	5,800	25	20	40	65	40
5	Gravel -----	10,150	6,090	3,400	25	20	50	70	60
6	Dirt -----	4,900	2,940	1,600	25	25	60	80	90

¹ Reduction factors are maximum under extreme conditions.

c. Planned tonnage movement should not exceed the capability of any portion of the road net to be used, unless reconstruction or heavy maintenance is provided to increase the capability of the section of highway or bridge to meet the demands. Otherwise, alternate routes must be selected to distribute the load. If no

alternate route is available and the indicated tonnage is not reduced, the highway or bridge can be expected to deteriorate rapidly and disrupt any sustained operation. (It should be kept in mind that maintenance vehicles and personnel on a road may also interfere with the flow of traffic and thereby limit capability.)

Section IV. PIPELINES

7-14. Capacity

The capacities of pipeline systems vary, depending on the size of pipe, gradient, location and size of pumps, and type of construction. Pipelines are capable of multiproduct opera-

tion. Welded commercial-type pipelines can be operated at much greater pressures than standard military victaulic-coupled lines. For planning purposes, the following capacities may be used:

Capacity of Standard Military Lightweight Steel Tubing

	1	2	3	4	5	6	7
1	Inside diameter of line (in.)	Normal design capacity (bbl per hr)	Emergency capacity (bbl per hr)	Safeworking pressure (psi)	Maximum working pressure (psi)	Gallons per day ¹	Net short tons per day
2	4 -----	355	393	600	750	298,000	910
3	6 -----	785	1,000	600	750	660,000	2,000
4	8 -----	1,355	1,730	450	600	1,140,000	3,480
5	12 -----	7,150	11,400	300	530	6,000,000	18,300

¹ Computed at normal design capacity, using an average operating day of 20 hours (average, all products).

7-15. Capability

Generally two 8-inch and one 6-inch pipelines or one 8-inch and three 6-inch pipelines are required (depending on the width of front) to maintain a 12-division slice plus air support.

For rapid planning of POL requirements, the average daily consumption of 1 division plus 1½ air wings equals 760 short tons (6,025 barrels) per day. This requirement is divided approximately 55 percent Air Force and 45 percent Army.

Section V. RAILWAYS

7-16. General

a. Railway construction data are contained in chapter 8.

b. Estimates of railway capacity, operating personnel, equipment, and supply requirements for a specific railway line should take into consideration the basic characteristics of the line, the nature of the country in which the operation is planned, and the purpose for which the planning is being done. The following items are considered essential to intelligent appraisal. If these are not available, their effects upon the operation must be assumed, based on overall information of railroad operations within the country involved.

- (1) Length of line.
- (2) Condition of roadbed and track.
- (3) Gage of track.¹
- (4) Single, double, or multiple track.
- (5) Weight and cross section of rail.
(Where mixed rail occurs, a complete inventory of rail and compromise rail joints is desirable.)
- (6) Type of ballast and depth.
- (7) Type of ties (if wood, treated or untreated).
- (8) Tie spacing.
- (9) Axle load limitations (track and bridge).
- (10) Profile of line showing location and length of ruling grade. (Any helper grade or any momentum grade which is not the ruling grade should show location and description.)
- (11) Alinement of line showing location, length of minimum radius curves, and superelevation.

¹ Track gages vary widely, starting at 1 foot, 11-3/5 inches (0.80 m) and going to 5 feet 6 inches (1.676 m). The most widely used gages are—

Broad	Standard	Narrow
5 ft 6 in/1.676 m	3 ft 6 in/1.067 m	
5 ft 3 in/1.600 m	4 ft 8 1/2 in/1.435 m	3 ft 3 3/4 in/1.00 m
5 ft 0 in/1.524 m		3 ft 0 in/0.914 m

- (12) Location and description of bridges and tunnels.
- (13) Location, length, and description of passing tracks.

- (14) Location, type, and quantity of fuel supply.
- (15) Location, quantity, and quality of water supply.
- (16) Location and capacity of yards.
- (17) Location and capacity of—
 - (a) Car repair tracks and enginehouses.
 - (b) Heavy repair shops.
- (18) Type and availability of motive power.
 - (a) Weight in working order.
 - (b) Expected working tractive effort.
 - (c) Age.
- (19) Type and availability of rolling stock.
 - (a) Capacity and dimension.
 - (b) Age.
- (20) Allowable drawbar pull.
- (21) Diagrams showing minimum structure, maximum unrestricted loading, and equipment gages.
- (22) Signal system.
- (23) Dispatching facilities.
- (24) Route junctions.
- (25) Availability of new equipment and repair parts.
- (26) Indigenous labor resources.
- (27) Determine the attitude and loyalty of local personnel. (Can guerrilla operations be expected?)

c. A military railway operating division will vary from approximately 150 to 250 kilometers, depending on existing conditions. For general planning purposes, however, an average of 150 kilometers per railway division may be assumed.

7-17. Evaluation and Planning

Paragraphs 7-8 through 7-26 are designed primarily for wartime estimates of railway operations in a theater of operations. Analytical refinements and elaborate train density studies are difficult to justify and have been avoided because of the lack of basic information and the relative uncertainty inherent in military operations. The planner should also bear in mind that in the early stages of a war, indigenous equipment, and labor may be utilized to a large extent, which again may vary the ex-

pected tonnage capacity. A more detailed estimate may be made using those methods and factors contained in FM 55-21.

7-18. Train Density

Train density is the number of trains per day which can be operated in each direction over a railway line. Work trains are not included in train density. Train densities will vary, depending on the condition of track; location, length, and type of passing siding; adequacy of terminal facilities; and availability of motive power and rolling stock. Densities recommended below are averages based on experience under theater of operations conditions. After air superiority has been attained, the intensity of combat has been reduced, and, depending on judgment of operating conditions, densities achieved may be expected to exceed by 20 percent those presented below. (For planning capacities, see para. 7-4).

Single track lines¹ ---- 10 trains per day in each direction.

Double track lines ---- 30 trains per day in each direction.

Multiple track lines ---- The extra tracks will be used to rehabilitate and maintain two tracks in operation under most theater of operations conditions.

¹ Passing track intervals of 10-15 kilometers.

7-19. Net Trainload

The net trainload, or payload, carried by trains on different divisions of the same line may vary greatly, depending on the conditions of operation. Experience indicates that, under normal theater of operations conditions over standard gage railways, a single engine net trainload of 400 short tons may be used as an narrow gage railways, a single engine net trainload *average* for general planning purposes. On trainload of 300 short tons may be used.

7-20. Net Division Tonnage

a. Net division tonnage is the net tonnage (short tons) or payload which can be moved over a railway division each day.

Formula:

$$\text{Train density} \times \text{average net trainload} = \text{Net division tonnage.}$$

b. Troop, hospital, or other special trains will replace an equal number of tonnage trains and, when operation of such trains is anticipated, the factor for train density must be so adjusted with the resulting decrease in net division tonnage.

7-21. Equipment Estimation

Planning data included herein are based on use of standard U.S. Transportation Corps equipment. Allowances for use of indigenous or captured equipment should be based on judgment after evaluation of the many factors involved, such as availability of equipment, extent of expected destruction, condition of equipment, types and local availability of fuel, availability of repair parts, types of coupling devices, etc. Planning data are available in FM 55-15, TM 55-206, logistical surveys, special transportation studies based on intelligence reports, reports of governments or railroads in peacetime, and from articles appearing in such publication as *Railway Gazette* (British) and *Railway Age* (United States).

a. *Road Engines.* The following data are recommended for general planning purposes. Computation of requirements should be made for each division separately.

- (1) Average rate of travel from division terminal to division terminal—13 kilometers per hour.
- (2) Time in each division terminal for steam locomotives—8 hours.*
- (3) Time in each division terminal for diesel-electric locomotives—3 hours.¹
- (4) Reserve engines, to allow for unforeseen circumstances such as operational peaks, heavy repairs, or destruction—20 percent.

Formula:

$$\text{TD} \times \frac{\text{RT} + \text{TT}}{24} \times 2 \times \text{RF} = \text{Number required for division.}$$

* Allows time for locomotive servicing, running repairs, and time lost between enginehouse and yards.

When TD = train density, one way.
 RT = average running time
 in hours.
 TT = terminal time at one
 end of the division.
 24 = number of hours in a
 day.
 RF = operational reserve fac-
 tor = 1.2.

b. Switch Engines.

- (1) Switch engine requirements at water and inland terminals and division terminals are dependent on the physical track layout and the number of cars required to be handled at such points. The following may be used as a general guide only:

	1	2
1	Location	Requirements
2	Water and inland terminals -----	1 per 67 cars dispatched or received per day.
3	Division terminals -----	1 per 100 cars passing per day.

- (2) Requirements as computed above should be increased by 20 percent to allow for unforeseen circumstances, repairs, etc.

c. Rolling Stock.

(1) *Freight.*

- (a) Requirements are computed separately for operations between major supply installations or areas on each line of communications as follows:

$$\frac{\text{Daily tonnage}}{\text{Average tons per car}} \times \text{turnaround time} = \text{Number of cars.}$$

Turnaround time is the total estimated number of days required for a car from the time it is placed for loading at its point of origin, moved to its destination, unloaded, and returned to its point of origin. Such time may be computed as follows: allow 2 days at origin, 1 day at destination, and 2 days transit time for each division (or major portion thereof) which the cars must traverse. This method, rather than an actual hour basis, is used to incorporate delays due to terminal and way-station switching

as well as intransit rehandling of trains.

- (b) Computations should be increased by 10 percent to meet operational peaks, commitments for certain classes of cars, and bad order cars.
 (c) An average planning factor for net load per car may be assumed as follows:

Standard gage to broad gage
 U. S. equipment ----- 20 tons
 Foreign equipment ----- 10 tons

Narrow gage
 U. S. equipment ----- 15 tons
 Foreign equipment ----- 7½ tons

- (d) Tank car requirements are computed separately, based on the bulk POL requirement and the computed turnaround time.
 (2) *Passenger.*
 (a) Passenger car requirements will vary, depending on troop movement policies, evacuation policies, and rest and recuperation policies.
 (b) Theater passenger car requirements are normally fulfilled by acquisition of local equipment, with the exception of hospital cars or trains.

7-22. Characteristics of U.S. Rolling Stock

	1	2	3	4	5	6	7	8
1	Type of car	Gage	Capacity		Tare weight (empty tons)	Inside dimensions		
			Cargo space	Tons		Length	Width	Height
	I. Foreign service							
2	Box (30-ton) -----	Narrow	1,588 cu ft	30	13.6	34'5½"	7'¾"	6'4"
3	Box (40-ton) -----	Std to broad	2,520 cu ft	40	18.5	40'6"	8'6"	6'5½"
4	Flat (30-ton) -----	Narrow	247 sq ft	30	10.9	34'5⅞"	7'2"	-----
5	Flat (40-ton) -----	Std to broad	351 sq ft	40	14.5	40'9"	8'7¼"	-----
6	Flat (80-ton) -----	Std to broad	447 sq ft	80	33.3	46'4"	9'8"	-----
7	Flat, depressed center (70-ton) -----	Std to broad	193 sq ft	70	41.5	50'7"	9'8"	-----
8	Gondola, high-side (30-ton) -----	Narrow	946 cu ft	30	13.0	34'5"	6'10½"	4'0"
9	Gondola, high-side (40-ton) -----	Std to broad	1,680 cu ft	40	18.0	40'0"	8'8¾"	4'0"
10	Gondola, low-side (30-ton) -----	Narrow	356 cu ft	30	12.1	34'6"	6'10½"	1'6"
11	Gondola, low-side (40-ton) -----	Std to broad	500 cu ft	40	16.0	40'4½"	8'3¼"	1'6"
12	Tank, POL (6,000-gal) -----	Narrow	6,000 gal	20	16.0	-----	-----	-----
13	Tank, POL (10,000-gal) -----	Std to broad	10,000 gal	35	19.0	-----	-----	-----
	II. Domestic service							
14	Box (50-ton) -----	Std	3,975 cu ft	50	23.0	40'6"	9'2"	11'0"
15	Flat (50-ton) -----	Std	454 sq ft	50	25.5	43'3"	10'6"	-----
16	Flat (70-ton) -----	Std	513 sq ft	70	27.0	49'11"	10'3"	-----
17	Flat (100-ton) -----	Std	562 sq ft	100	35.0	54'0"	10'6¼"	-----
18	Gondola, high-side (50-ton) -----	Std	1,770 cu ft	50	25.0	41'6"	9'6"	4'6"
19	Gondola, low-side (50-ton) -----	Std	1,184 cu ft	50	23.0	41'6"	9'6"	3'0"
20	Tank, POL (10,000-gal) -----	Std	10,000 gal	35	23.0	-----	-----	-----

Note. Average payload for each type of car, except cars is 50 percent.

7-23. Outsize Equipment

Outsize equipment is that equipment which, because of extreme dimensions (height, width, length) or extreme weight, or combinations of the foregoing, will require special handling under restricted speeds and/or on special cars. The planner should recognize the fact that more and more of this type of equipment is being designed and should attempt to build a train of these outsize loads for a single movement rather than assume a few in each train moving on the line of communications. Such movements require special meeting points on adjacent lines of a double track line of communications and will retard traffic returning to its point of origin as well as following trains in the same direction.

7-24. Personnel Requirements

The basic unit of railway organization in a theater of operations is the transportation railway operating battalion. This battalion operates and maintains a division of railway which is similar to U. S. commercial railroad organization. Military organizations of administrative personnel needs of the several divisions to fulfill the operating personnel needs of the basic units (railway divisions) and the administrative personnel needs of the several divisions comprising a system of railways. Personnel requirements are therefore estimated by division.

7-25. Supervisory, Operating, and Maintenance Organizations

a. Supervisory. The following organizations are supervisory:

- (1) *General headquarters, transportation railway service* (TOE 55-201). Normal requirement: One per two or more transportation railway commands.
- (2) *Headquarters and headquarters company transportation railway command* (TOE 55-302). Normal requirement: One per two or more transportation railway groups.
- (3) *Headquarters and headquarters company, transportation railway group*

(TOE 55-202). Normal requirements: One per two to six transportation railways operating battalions and one or two transportation railway shop battalions.

b. Operating. Transportation railway operating battalion (TOE 55-225).

- (1) Requirements are estimated on the basis of the number of traincrews required. The 50 traincrews provided in company C of the battalion are the controlling factor. When augmentation is necessary, additional crews are provided by TOE 55-500, transportation service organization. This augmentation does not upset the equilibrium of the battalion for carrying out its assigned function, providing the normal length of line to be operated is not exceeded or motive power added exceeding the capabilities of company B for equipment maintenance. Normally, one transportation railway operating battalion is assigned to a railway division (usually 150-250 kilometers of main track).
- (2) In estimating traincrew requirements, the following basis may be used:
 - (a) *For road operations.* One crew per train per day (moving in either direction) per division.
 - (b) *For switching.* Two crews per switching engine in operation. (For general planning purposes, reserve switch engines are not considered.)
 - (c) *For road operations and switching.* Assume 80 percent availability of assigned crews to allow for sickness and other absences.

c. Maintenance.

- (1) *Transportation railway shop battalion* (TOE 55-235). Under normal requirements, one shop battalion may be expected to support 100 steam locomotives, 200 diesel-electric locomotives, and 2,500 cars; or perform depot maintenance monthly for 10 steam locomotives, 25 diesel-electric

locomotives, and 600 cars. Exact requirements should be tempered by judgement and the overall railway plan for the theater.

- (2) *Railway workshop, mobile* (TOE 55-500). The railway workshop, mobile, may be required to provide back shop support in the initial phase of rail operations before the arrival of the shop battalion, or to perform repairs in forward areas to restore war-damaged equipment or to augment a

railway shop battalion in lieu of an additional shop battalion.

7-26. Supply

- a. *Fuel and Lubricants*. (See para 5-13—5-24.)
- b. *Repair Parts*. Estimated repair parts requirements for motive power and rolling stock: 1.5 short tons per month for each train per day (moving in either direction) over each division.

Section VI. MOVEMENT OF TROOP UNITS BY RAIL

7-27. Space Requirements for Troop Loading on U.S. Equipment (CONUS ONLY)

For planning purposes and staff training, the following assumptions may be used:

a. *Sleeping Cars, Average*. Twenty-six troops in U.S. equipment (standard pullman).

- (1) Normally, all personnel will be moved in standard pullmans, two per section.
- (2) In an emergency or during periods when there is a shortage of pullman equipment, it may be necessary to move personnel three per section. In this case, plans should be based on an average of 39 per standard pullman.

b. *Coaches, Average*. Fifty-five troops with individual equipment.

c. *Passenger Trains* (typical for long-distance moves). Thirteen sleeping cars, 2 kitchen cars, and 1 or 2 baggage cars—average 350 troops per train.

d. *Freight Trains*. For troop unit moves, including heavy equipment such as tanks, artillery, vehicles, and engineer equipment, seldom exceed 65 cars (650 short tons) for infantry units; 55 cars (1200 short tons) for armored units.

e. *Mixed Trains*.

- (1) Mixed trains which carry all the personnel with their vehicles, artillery, and equipment are authorized only for reasons of military necessity. They

are, at times, desirable from a tactical and organizational standpoint. Such moves are not economical when passenger equipment is in short supply, since mixed trains move at freight speed, and equipment is not fully utilized.

- (2) To maintain unit integrity (personnel and equipment), to include loading of all trailers with towing vehicles, will require 10 percent additional flatcars over those required for separate loading.

7-28. Loading of Organizational Equipment

a. The amount of headquarters, kitchen, and maintenance equipment varies somewhat in all units. For planning purposes, allow 20 short tons per company or equivalent unit.

b. Organizational equipment moves under applicable freight classification rules and rates dependent on loading requirements. Checkable baggage up to 150 pounds on domestic moves and, normally, 350 pounds on moves to Army terminals will be carried free on the transportation tickets. When transportation groupings permit, checkable baggage for two companies or similar units may be loaded together.

c. For company or larger unit movements, CONEX containers should be utilized wherever practicable for consolidation and security of organizational equipment and baggage allowance less hand baggage.

7-29. Kitchen-Baggage and Flatcars

a. Kitchen-baggage and kitchen cars are furnished on the basis of one per 250 men or fraction thereof. Kitchen-baggage car requirements per train are dependent on transportation groupings. For tentative estimates, allow one per unit.

b. Compute flatcars (or drop-end gondolas) required on basis of maximum utilization of each car, regardless of length. Do not restrict computation to cars of all one length. Twelve inches at one end of each car must be left for brake wheel clearance. For detailed approved see Association of American Railroads Manual. *Rules Governing the Loading of Commodities on Open Top Cars*, also; *Major Caliber Guns for the United States Army and Navy, on Open Top Equipment*.

7-30. Recommended Loading of Typical Vehicles and Equipment

	1	2	3
1	Nomenclature	Rail car	Unit per car
2	Carrier, command post, M577	40'0" flat	2
3	Carrier, pers, full-tracked, armd, M59	40'0" flat	2
4	Carrier, personnel, full-tracked, M113	40'0" flat	2
5	Carrier, command and reconnaissance, full-tracked, M114	40'0" flat	2
6	Gun, twin 40-mm, SP, full-tracked, M42	40'0" flat	2
7	Howitzer, 105-mm	40'0" flat	2
8	Howitzer, 155-mm	40'0" flat	1
9	Howitzer, 155-mm, SP, full-tracked, M44 and M44A1	46'0" flat	2
10	Recovery vehicle, light armored, M578	46'0" flat	2
11	Semitrailer, cgo van, 6-ton, 2-wheel, M119	50'6" flat	2

a. Airborne Infantry Division, TOE 57E (Strength (Base) 5,954)

	1	2	3	4	5	6	7
1	TOE(S)	Unit	Flats (See note 2)	Officer	Warrant Officer	Enlisted	Total division personnel
2	57-4	Hq & Hq Co.	18	41		93	134
3	57-42	Hq & Hq Co Bde	10	23	6	80	118
4	17-75	Armd Cav Sqdn	44	33	21	526	588

See notes at end of table.

	1	2	3
1	Nomenclature	Rail car	Unit per car
12	Semitrailer, tk transporter, 50-ton, 8-wheel, M15A2	40'0" flat	1
13	Tank, cmbt, full-tracked, lt gun, M41A1	50'6" flat	2
14	Tank, cmbt, full-tracked, med gun, M48	40'6" flat	1
15	Tank, cbt, full-tracked, 105-mm gun, M60A1	40'6" flat	1
16	Tank, cmbt, full-tracked, 120-mm gun, M103	40'0" flat	1
17	Tank recovery vehicle, med, M74	50'6" flat	2
18	Tank, recovery vehicle, M88	50'6" flat	2
19	Truck, util, ¼-ton, 4 x 4	50'6" flat	3
20	Truck, cgo, ¾-ton, 4 x 4	50'6" flat	3
21	Truck, cgo, 2½-ton, 6 x 6, WVN	50'6" flat	2
22	Truck, dump, 2½-ton, 6 x 6, WVN	46'0" flat	2
23	Truck, cgo, 5-ton, 6 x 6, WVN	56'0" flat	2
24	Truck, med wkr, 5-ton, 6 x 6, WVN, M62	40'0" flat	1
25	Truck, tractor, 5-ton, 6 x 6, M52	40'0" flat	2
26	Truck, gun-lifting, hv, 4 x 6, front, M249	40'0" flat	1

7-31. Airborne Infantry, Infantry, Infantry Mechanized, and Armored Division Rail Moves

The following tables show the amount of rail equipment needed to move airborne infantry, infantry, infantry mechanized, and armored divisions. The specific types of equipment to be used and the detailed makeup of each train must be worked out between the unit transportation officer and the installation transportation officer (CONUS movements) or the transportation officer of the area in which the movement originates (theater of operations movements).

	1	2	3	4	5	6	7
1	TOE(S)	Unit	Flats (See note 2)	Officer	Warrant Officer	Enlisted	Total division personnel
5	17-76	Hq & Hq Trp.....	21	16	2	133	1,661
6	17-77	Armd Cav Trp.....2 ea	8	5		137	
7	17-78	Air Cav Trp.....	8	12	19	119	
8	6-200	Div Arty.....	185	146	13	1,502	
9	6-201	Hq & Hq Btry Div Arty.....	25	31	4	153	
10	6-215	FA How Bn 105-mm.....3 ea	50	36	3	411	
11	6-216	Hq & Hq & Svc Btry.....	19	18	3	129	
12	6-217	FA How Btry 105-mm.....3 ea	10	6		94	
13	6-228	FA Btry HJ.....	21	7		116	
14	1-55	Avn Bn.....	34	46	23	241	310
15	1-56	Hq Hq Det.....	9	10	1	57	643
16	1-57	Air Mob Co.....	12	13	16	82	
17	1-58	Avn Gen Supt Co.....	13	23	6	102	
18	5-25	Engr Bn.....	102	35	2	606	
19	5-26	Hq & Hq Co.....	47	20	2	192	
20	5-27	Engr Co.....3 ea	18	5		138	407
21	11-215	Sig Bn.....	38	15	4	388	
22	11-216	Hq & Hq Co.....	6	7	2	57	
23	11-217	Cmd Op Co.....	20	3	2	199	
24	11-218	Fwd Commo Co.....	12	5		132	
25	19-67	Military Police Co.....	8	8	1	147	156
26	29-51	Supt Cmd.....	271	128	17	1,557	1,702
27	29-52	Hq & Hq & Band.....	3	15	1	67	1,702
28	12-157	Admin Co.....	12	29	6	279	
29	8-65	Med Bn.....	43	40		311	
30	8-66	Hq & Spt Co.....	15	16		101	
31	8-67	Med Co.....3 ea	6	8		70	
32	29-45	Sup & Trans Bn.....	32	19	3	374	
33	29-46	Hq & Hq Det.....	6	10	1	48	
34	10-37	Sup & Svc Co.....	13	4		88	
35	10-337	QM Air Equip Co.....	13	5	2	238	
36	29-55	Maint Bn.....	58	25	7	526	1,702
37	29-56	Hq & Maint Spt Co.....	30	14	3	188	
38	29-57	Fwd Spt Det.....	7	3		54	
39	55-99	Trans Acft Maint Co.....	18	2	4	176	
40		TOTAL.....	370	526	99	5,321	5,954

Notes.

- Total amounts reflect Division Base only.
- Quantity based upon mixed loading requirements; increase quantities 10 percent for separate loading. All quantities reflect single units. Does not include loading of aircraft.
- Baggage: One box car per two company size units; substitute with baggage cars (ratio 1:1) for separate loading.
- Sleepers:
 - Standard Pullman: 26 troops (2 per section)
 - Emergency Periods: 39 troops (3 per section)
 - Coaches: 52 troops w/individual equipment (average)
 Use emergency period data above for separate loading.
- Typical long distance move requirements:
 - 850 troops per train
 - 13 sleeping cars
 - 2 kitchen cars
 - 1-2 baggage cars
- Flatcars used in table compilation include:
 - 40 foot, 50 ton
 - 46 foot, 50 ton
 - 50 foot, 6 inch, 50 ton
 - 56 foot, 200 ton

b. Infantry and Tank Battalions, Airborne (TOE 7-35 and 17-15).

	1	2	3	4	5	6	7
1	TOE(S)	Unit	Flats	Officer	Warrant Officer	Enlisted	Total division personnel
2	7-35	Inf Bn.....	36	36	2	790	
3	7-36	Hq & Hq Co.....	30	18	2	268	
4	7-37	Rifle Co.....3 ea.....	2	6		174	
5	17-15	Tank Bn.....	44	34	2	456	
6	17-16	Hq & Hq Co.....	35	19	2	234	
7	17-18	Tank Co.....3 ea.....	3	5		74	

Typical type Infantry division airborne may be organized with 1 infantry division airborne TOE 57E, 9 Infantry battalions airborne TOE 7-35 and 1 tank battalion airborne TOE 17-15.

c. Infantry Division (TOE 7E)

	1	2	3	4	5	6	7
1	TOE(S)	Unit	Flats (See note 2)	Officer	Warrant Officer	Enlisted	Total division personnel
2	7-4	Hq & Hq Co, Inf Div.....	18	42		95	137
3	7-42	Hq & Hq Co, Inf Bde.....3 ea.....	17	23	6	94	369
4	17-105	Armd Cav Sqdn.....	107	45	22	749	816
5	17-106	Hq & Hq Trp.....	41	18	3	199	
6	17-107	Armd Cav Trp.....3 ea.....	18	5		146	
7	17-108	Air Cav Trp.....	10	12	19	112	
8	6-100	Div Arty.....	327	191	17	2,308	2,516
9	6-302	Hq & Hq Btry, Div Arty.....	30	34	4	167	
10	6-155	FA How Bn 105-mm Tow.....3 ea.....	63	36	3	448	
11	6-156	Hq & Hq & Svc Btry.....	29	18	3	151	
12	6-157	FA How Btry 105-mm Tow.....3 ea.....	11	6		99	
13	6-165	FA How Bn 155-mm 8-in.....	74	27	2	576	
14	6-166	Hq & Hq & Svc.....	30	15	2	155	
15	6-167	FA How Btry 155-mm.....3 ea.....	10	3		103	
16	6-168	FA Btry 8-in.....	14	3		112	
17	6-175	FA Msl Bn (HJ) (SP).....	34	22	2	221	
18	6-176	Hq & Hq Btry.....	17	12	2	89	
19	6-177	FA Msl Btry 762-mm (SP).....2 ea.....	9	5		66	
20	1-75	Avn Bn.....	41	45	23	250	318
21	1-76	Hq & Hq Det.....	10	10	1	50	
22	1-77	Airmbl Co (Lt).....	14	13	16	87	
23	1-78	Avn Co (GS).....	16	23	6	113	
24	5-155	Engr Bn.....	155	44	2	896	942
25	5-156	Hq & Hq Co.....	46	19	2	169	
26	5-157	Engr Co.....4 ea.....	21	5		145	
27	5-148	Bridge Co.....	27	5		148	
28	11-35	Signal Bn.....	77	24	4	547	575
29	11-36	Hq & Hq Det.....	9	10	3	36	
30	11-37	Cmd Op Co.....	27	4	1	175	
31	11-38	Fwd Commo Co.....	30	5		159	
32	11-39	Sig Spt Co.....	11	5		177	
33	19-27	Military Police Co.....	15	9	1	179	189
34	29-1	Spt Command.....	373	141	23	1,778	1,942
35	29-2	Hq & Band.....	8	17	1	79	
36	12-37	Admin Co.....	11	30	6	297	
37	8-35	Medical Bn.....	61	40		356	

See notes at end of table.

1	2	3	4	5	6	7
TOE(S)	Unit	Flats (See note 2)	Officer	Warrant Officer	Enlisted	Total division personnel
38	8-36 Hq & Spt Co.....	24	16		116	
39	8-37 Med Co.....3 ea.....	12	8		80	
40	29-5 Spt & Trans Bn.....	119	25	2	398	
41	29-6 Hq & Hq Co.....	7	15	1	62	
42	10-7 Sup & Svc Co.....	14	5		118	
43	55-88 Trans Mtr Trans Co.....	99	5	1	218	
44	29-15 Maint Bn.....	173	29	14	648	
45	29-16 Hq & Maint Spt Co.....	56	15	4	260	
46	29-17 Fwd Spt Co.....3 ea.....	30	4	2	71	
47	55-89 Acft Maint Co.....	28	2	4	175	
48	TOTAL (1).....	1,808	610	110	7,084	7,804

Notes.

- Total amounts reflect Division Base only.
- Quantity based upon mixed loading requirements; increase quantities 10 percent for separate loading. All quantities reflect single units. Does not include loading of aircraft.
- Baggage: One box car per two company size units; substitute with baggage cars (ratio 1:1) for separate loading.
- Sleepers:
 - Standard Pullman: 28 troops (2 per section)
 - Emergency Periods: 39 troops (3 per section)
 - Coaches: 52 troops w/individual equipment (average)
 Use emergency period data above for separate loading.
- Typical long distance move requirements:
 - 350 troops per train
 - 13 sleeping cars
 - 2 kitchen cars
 - 1-2 baggage cars
- Flatcars used in table compilation include:
 - 40 foot, 50 ton
 - 46 foot, 50 ton
 - 50 foot, 6 inch, 50 ton capacity
 - 56 foot, 200 ton

d. Infantry and Tank Battalions (TOE 7-15 and 17-35).

1	2	3	4	5	6	7
TOE(S)	Unit	Flats	Officer	Warrant Officer	Enlisted	Total division personnel
2	7-15 Inf Bn.....	52	37	2	791	
3	7-16 Hq & Hq Co.....	40	19	2	269	
4	7-18 Rifle Co.....3 ea.....	4	6		174	
5	17-35 Tank Bn.....	114	34	3	538	
6	17-36 Hq & Hq Co.....	53	19	3	283	
7	17-37 Tank Co.....3 ea.....	20	5		85	

Typical type infantry division could be organized with 1 infantry division, TOE 7E, 8 infantry battalions, TOE 7-15, and 2 tank battalions, TOE 17-35.

e. Infantry Division—Mechanized (TOE 7E).

1	2	3	4	5	6	7
TOE(S)	Unit	Flats (See note 2)	Officer	Warrant Officer	Enlisted	Total division personnel
2	37-4 Hq & Hq Co.....	18	42		100	142
3	37-42 Hq & Hq Co Bde.....3 ea.....	17	23	6	111	140

See notes at end of table.

	1	2	3	4	5	6	7
	TOE (S)	UNIT	Flats (See note 2)	Officer	Warrant Officer	Enlisted	Total division personnel
4	17-105	Armd Cav Sqdn.....	107	45	22	749	816
5	17-106	Hq & Hq Trp.....	41	18	3	199	
6	17-107	Armd Cav Trp..... 3 ea	18	5		146	
7	17-108	Air Cav Trp.....	10	12	19	112	
8	6-300	Div Arty.....	269	191	17	2,208	2,416
9	6-302	Hq & Hq Btry Div Arty.....	30	34	4	167	
10	6-345	FA How Bn 105-mm..... 3 ea	48	36	3	419	
11	6-346	Hq & Hq & Svc Btry.....	29	18	3	158	
12	6-347	FA How Btry 105-mm (SP)..... 3 ea	7	6		87	
13	6-355	FA How Bn 155-mm 3-in.....	65	27	2	563	
14	6-356	Hq & Hq & Svc Btry.....	31	15	2	163	
15	6-357	FA How Btry 155-mm..... 3 ea	5	3		98	
16	6-358	FA Btry 8-in.....	12	3		106	
17	6-175	FA Msl Bn (HJ) (SP).....	38	22	2	221	
18	6-176	Hq & Hq Btry.....	20	12	2	89	
19	6-177	FA Msl Btry 7.62-mm (SP)..... 2 ea	9	5		66	
20	1-75	Avn Bn.....	41	45	23	250	318
21	1-76	Hq & Hq Det.....	10	10	1	50	
22	1-77	Armb Co (Lt).....	14	13	16	87	
23	1-78	Avn Co (GS).....	16	22	6	113	
24	5-145	Engr Bn.....	139	44	2	910	956
25	5-146	Hq & Hq Co.....	46	19	2	169	
26	5-147	Engr Cmbt Co..... 4 ea	17	16		145	
27	5-148	Bridge Co.....	26	5		148	
28	11-35	Signal Bn.....	90	24	4	547	575
29	11-36	Hq & Hq Det.....	9	10	3	36	
30	11-37	Cmd Cp Co.....	27	4	1	175	
31	11-38	Fwd Commo Co.....	30	5		159	
32	11-39	Sig Spt Co.....	11	5		177	
33	19-27	Military Police Co.....	15	9	1	179	189
34	29-11	Spt Cmd.....	721	141	23	1,948	2,112
35	29-2	Hq & Band.....	8	17	1	79	
36	12-37	Admin Co.....	11	30	6	297	
37	8-35	Med Bn.....	61	40		356	
38	8-36	Hq & Spt Co.....	24	16		116	
39	8-37	Med Co..... 3 ea	12	8		80	
40	29-65	Sup & Trans Bn.....	95	25	2	420	
41	29-6	Hq & Hq Co.....	7	15	1	62	
42	10-7	Sup & Svc Co.....	14	5		118	
43	55-87	Trans Mtr Trans Co.....	114	5	1	240	
44	29-25	Maint Bn.....	149	29	14	796	
45	29-26	Hq & Maint Spt Co.....	65	15	4	360	
46	29-27	Fwd Spt Co..... 3 ea	36	4	2	87	
47	55-89	Acft Maint Co.....	28	2	4	175	
48		TOTAL (1).....	1,451	610	110	7,235	7,944

Notes.

- Total amounts reflect Division Base only.
- Quantity based upon mixed loading requirements; increase quantities 10 percent for separate loading. All quantities reflect single units. Does not include loading of aircraft.
- Baggage: One box car per two company size units; substitute with baggage cars (ratio 1:1) for separate loading.
- Sleepers:
 - Standard Pullman: 26 troops (2 per section)
 - Emergency Periods: 39 troops (3 per section)
 - Coaches: 52 troops w/individual equipment (average)
 Use emergency period data above for separate loading.

5. Typical long distance move requirements:
 850 troops per train
 18 sleeping cars
 2 kitchen cars
 1-2 baggage cars
6. Flatcars used in table compilation include:
 40 foot, 50 ton
 46 foot, 50 ton
 50 foot, 6 inch, 50 ton
 56 foot, 200 ton

f. Infantry and Tank Battalions (TOE 7-45 and 17-35).

	1	2	3	4	5	6	7
1	TOE(S)	Unit	Flats	Officer	Warrant Officer	Enlisted	Total division personnel
2	7-45	Inf Bn.....	71	37	2	862	
3	7-46	Hq & Hq Co.....	39	19	2	283	
4	7-47	Rifle Co..... 3 ea	11	6		193	
5	17-35	Tank Co.....	114	34	3	538	
6	17-36	Hq & Hq Co.....	53	19	3	283	
7	17-37	Tank Co..... 3 ea	20	5		85	

Typical type infantry division mechanized may be organized with 1 infantry division mechanized (TOE 87E), 7 infantry battalions mechanized (TOE 7-45), and 2 tank battalions (TOE 17-35).

g. Armored Division (TOE 17E) (strength (base) 8,011).

	1	2	3	4	5	6	7	8	9	10
1	TOE	Unit	Pull-man ^{1,3}	Day Coach ²	Diner ³	Kitchen Car	Baggage	Flat ⁴	Heavy Duty Flat	Gon
2	17-4E	Hq & Hq Co.....	6	3	1	1	1	20		1
3	19-27E	MP Co.....	8	4	1	1	1	18		
4	1-75E	Avn Bn.....	12	6	2	2	2	53		
5	11-35E	Sig Bn.....	22	11	2	2	2	115		
6	5-145E	Engr Bn.....	37	19	4	4	4	215		6
7	17-42E	Bg Hq & Hq Co(3).....	17	9 ⁵	2	2	2	63		
8	17-015E	Armd Cav Sg.....	32	16	3	3	4	96		
9	6-300E	Div Arty.....	93	47	10	10	10	379		
10	20-21E	Support Comd.....	84	42	9	9	9	422		3
11		Total Base.....	311	157	34	34	35	1384		10
12	17-35	Tank Bn ⁵	22	11	2	2	2	114		2
13	7-45	Inf Bn (mech) ⁵	35	18	4	4	4	86		
		Total (type).....	368	186	40	40	41	1584		12

Notes.

- ¹ 26 men per standard sleeper.
² 52 men per day coach.
³ Preferred equipment.
⁴ May include the following lengths and capabilities—
 46 ft., 50-ton capacity
 50 ft., 50-ton capacity
 53 ft., 6 in., 70-ton capacity
⁵ Indicates a single battalion.

7-32. Weight of Tracked Vehicles

The tracked vehicles of the divisions with their towed loads, make up approximately the following tonnages:

Infantry Division (8 Inf Bns—
 2 Tk Bns) ----- 8,000 S/T
 Armored Division (6 Tk Bns—
 5 Mech Bns) ----- 38,000 S/T

Mechanized Division (6 Inf Mech

Bns—4 Tk Bns) ----- 31,600 S/T

(In theaters of operation and for mixed trains in the United States, the crews and other troops which normally travel in or on the tracked vehicles usually will ride on the same train.)

7-33. Movement of Troop Units on Foreign Railways

a. The capacity of railroads and railway equipment fluctuates widely throughout the nations of the world. Experience in Europe during World War II indicates that under the pressure of all-out war, there are few, if any, places in the world where complete troop units can be moved by rail at the same time that the rail net is supplying a major force. A compromise policy was developed in which tracked vehicles and foot troops were moved by rail whenever facilities were available and wheeled vehicles, with their normal towed loads, proceeded on highways.

b. Assumed capacity of foreign rail facilities.

(1) *Freight cars.*

War flats -----50 tons

Medium flatcars _25

Small flatcars _12 tons

Boxcars -----10 tons or 25 troops

(2) *Passengers.*

Coaches ¹ -----40 troops

Sleeping cars ¹ _32 troops

(3) *Trains (foreign).*

Maximum length _40 cars

Maximum net load 400 tons

Maximum troops _1,000 (using
boxcars)

¹ In the forward areas, passenger equipment is seldom used for unit moves. The limited amount of available equipment may be used for movement of casualties, convalescents, redeployment groups, or leave trains.

7-34. Troop Movement Planning

a. *Scales.* In training and preparation for movement, all units will become familiar with the use of railway car loading scales or equivalent scales, tables, or templates (para 7-35).

b. *Rail Movement Table.* Tables are to be

maintained by all units for movement by *all means* of transportation.

c. *Types of Tables.* When the rail movement has been ordered and the approximate types of equipment requested, the following tables must be prepared by each unit:

Train consist table (para 7-37).

Entraining table (para 7-38).

Individual train-loading plan (para 7-39).

d. *Alert Time—(CONUS).* An alert is not an order, and rail carriers do not move equipment into position for loading on an alert. It requires 96 hours after request for routing has been placed with the Military Traffic Management and Terminal Service (MTMTS) to start loading a division, assuming that no equipment is available at the installation.

e. *Loading Time—(CONUS).* Passenger trains require 1 hour for loading. Baggage cars for personal baggage and baggage cars for kitchen purposes will be spotted in advance. The time required to load troop units with all vehicles and equipment on freight trains varies with the training status of the unit and the conditions at the loading point. Use 6 hours for planning.

7-35. Railway Car Loading Templates

In preparing loading plans and determining flatcar requirements, car loading templates are helpful. The first step is to prepare templates to a suitable scale ($\frac{3}{8}$ " = 1 foot or $\frac{1}{2}$ " = 1 foot is recommended) for each item of equipment to be loaded. The transportation officer, or representative of the commercial carrier, can provide dimensions of the usable loading space of the various pieces of rolling stock which can be furnished. A diagram of the usable loading space is then drawn to the same scale as the equipment templates. By placing the templates over the usable loading space, the most economical car loading arrangements can be determined. Configurations for both tactical and administrative shipment of many items of military equipment are contained in TB 55-46.

7-36. Rail Movement Table^{1,2,3,4}
(Sample)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	TOE	Unit	Strength		Organiza- tional equipment		Checkable baggage		Vehicles and equipment per unit								Railway car requirements per unit									
									Standard vehicles						Special equipment		Passenger			Freight						
			Trailers			Trucks			Coach	Pullman		Box		Flatcar												
			Off & WO	EM	Pieces	Weight	Pieces	Weight	Trailer, amphib, cargo ¼-ton 4' W 9' L	Etc.	Etc.	Truck, utility, ¼-ton, 4x4 5' W 11.5' L	Etc.	Etc.	Items	Shipping length, feet	48 men	Std nr of sec (2 sec)	Tour nr of sec (3 sec)	Kitchen baggage	Organizational equipment	Checkable baggage	40'	42'	46'	50'
			2																							
3																										
4																										
5																										
6																										
7																										
8																										
9																										
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26																										

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	TOE	Unit	Strength		Organiza- tional equipment		Checkable baggage		Vehicles and equipment per unit								Railway car requirements per unit									
									Standard vehicles						Special equipment		Passenger			Freight						
			Trailers		Trucks				Coach	Pullman		Box					Flatcar									
			Off & WO	EM	Pieces	Weight	Pieces	Weight	Trailer, amphib, cargo ¼-ton 4' W 9' L	Etc.	Etc.	Truck, utility ¼-ton, 4x4 8' W 11.6' L	Etc.	Etc.	Items	Shipping length, feet	48 men	Std nr of sec (2 sec)	Tour nr of sec (3 sec)	Kitchen baggage	Organisational equipment	Checkable baggage	40'	42'	46'	50'
27																										
28																										
29																										
30																										
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¹ Can be adapted to any type unit.

² This tentative table should be maintained currently by division transportation section in compliance with paragraph 10, AR 220-10. Subordinate and separate units should maintain similar tables.

³ Upon receipt of movement order, the table will be revised to reflect actual strength and equipment on hand and to conform to provisions of the movement order.

⁴ Organizational equipment and checkable baggage must be listed separately.

7-37. Train Consist Table

Division

[illegible]

Notes.

1. Upon receipt of movement order, commanding general will designate the order in which units will be forwarded.
2. Train consist table is prepared by division transportation section from data appearing on revised rail movement table.
3. Maximum and minimum length of trains (total number of freight and passenger cars) will be prescribed by the origin railroad.
4. Under "transportation groupings," show units which will comprise each individual train.
5. Under "train officers," show by name the officers assigned to each train.

7-38. Entraining Table

Division

[illegible]

Notes

1. Upon completion of train consist table and individual train loading plan, division transportation section will prepare this entraining table.
2. "Train number" will be shown on train consist table.
3. In CONUS, the "main number," which authorizes the movement of each train, will be issued by the Military Transportation Section, Association of American Railroads, through the Military Traffic Management and Terminal Service, Washington, D.C., to the local transportation officer, who will furnish main number to division transportation section. In theaters of operation, the main number normally will be issued by the theater army logistical command transportation officer.
4. Entraining officers will be designated by name.

7-39. Individual Train-Loading Plan

Division

Train No. _____ Main No. _____

Assignment of Personnel and Equipment to Individual Railway Cars

Front

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	Continue to last car				rear

Figure 7-2

Suggested Symbols for Equipment and Vehicles

Equipment	Symbol	Equipment	Symbol	Equipment	Symbol	Equipment	Symbol
Coach	CH	Box	BX	Howitzer, 105-mm	HL		
Pullman, standard	SP	Truck, ¼-ton	TJ	Howitzer, 155-mm	HM		
Pullman, tourist	TP	Trailer, ¼-ton	TQ				
Troop sleeper	TS	Truck, 2½-ton	TC				
Kitchen car	K	Motorcycle	MC				
Kitchen-baggage	KB						

Assignment of Units to Cars (by Block Numbers Above)

Unit	Block No.	Unit	Block No.	Unit	Block No.

Notes.

- This plan is prepared by the division transportation section. Copies should be furnished to—
 - Troop commanders.
 - Officer in charge of troops (train).
 - Entraining officers.
 - Motor park dispatcher so that vehicles will arrive at entraining point in the order in which they will be loaded on railway cars.
 - Local transportation officer.
- In each block, indicate by symbol the specific personnel and equipment assigned to each car.
- In each block, representing an open-top freight car (flatcar or gondola car), indicate by symbol the equipment specifically assigned to each car.
- In the space provided at the bottom of the plan, all cars (freight and passenger) should be assigned by block numbers (not by railroad car initials and numbers) to the specific units which will occupy them.

Section VII. AIR TRANSPORTATION

7-40. General

a. The movement of troops by air transportation provided by the Air Force is normally ordered by the headquarters in command of both the transported and transporting units. These orders are issued simultaneously to the commander of the unit to be transported and to the commander of the transporting unit.

b. Troop movements by air are of two types: tactical and administrative. A tactical movement is a movement of troops under combat conditions when not in direct contact with the enemy. An administrative movement is any movement of units or supplies other than a tactical movement against the enemy. The loading plans will depend on the type of movement. The loading plans will vary depending on the mission, the aircraft available, the distance to be flown, the conditions of the flight, the security of the landing area, the time available for disassembly and assembly of equipment, the amount of supplies to be transported with the troops, the size of engineer tools needed in the terrain to be encountered, and other factors. For technical data on the loading of transport aircraft, see TM 57-210.

c. The air movement of a large body of troops normally will involve concurrent departures from several airfields and, in the objective area, concurrent landings at several terminal landing areas. The availability of transport aircraft and base facilities, the urgency of the situation, and the likelihood of hostile interference will be major factors which determine the number of installations employed, as well as the number of sorties to be made by the transporting aircraft. For staff procedures, air movement tables, and other forms relative to air movements, see TM 57-210 and FM 55-15.

7-41. Air Movement of Supplies

a. *General.* Supplies may be air-landed in powered aircraft, landed by parachute in standard containers or by heavy drop, or they may be delivered by the free-fall method or

by low level extraction. Supplies also may be air-landed in gliders or paragliders.

b. *Air-Landed.*

- (1) The allowable cargo load for each type of aircraft determines the amount of supplies and equipment that may be transported. TM 57-210 contains payload-distance graphs to assist the staff planner in determining allowable cargo loads for each type of aircraft for a given mission radius. Allowable cargo loads may have to be modified because of such variable conditions as temperature, altitude, and humidity. Therefore, the announced allowable cargo load for a given operational environment may differ from the planning factors shown.
- (2) To determine aircraft requirements, see chapter 24, TM 57-210.

c. *Parachute.*

- (1) The amount of supplies to be delivered by parachute from the various types of aircraft is dependent on the number and types of containers that can be carried and the container ejection means that can be employed. See TM 57-210 and TM 10-500-series manuals for aerial delivery characteristics of the various aircraft.
- (2) To determine aircraft requirements for the delivery of parachute supplies, divide the total weight of the cargo to be transported by the allowable cargo load of each aircraft.

7-42. Army Aircraft

a. *General.* Army aircraft, both fixed-wing and rotary-wing, are employed to move cargo, personnel and equipment. Performance standards are affected by many variables, such as load/fuel, altitude, temperature, humidity, existing weather, airfield characteristics, and individual aircraft characteristics. The weight-lifting capabilities of all aircraft are particu-

larly dependent on air density or density altitude, which is composed of the three variables: altitude, temperature, and humidity. As air density decreases, lift capability decreases. Wind can materially affect operations; and in operations requiring long ranges or maximum lift capabilities, wind may become a critical factor. Payloads may be increased or decreased because of variations in radius or range, density, altitude, and wind velocity. The Army aviation staff officer should be consulted for accurate, detailed computations to meet specific requirements. The information in the figure 7-3 (b below) was prepared to determine optimum data for planning by commanders and staff officers and to provide reliable data for practical use by Army aviators operating under normal conditions without undue sacrifice in loads required to accomplish the mission of Army aviation. Overloading of aircraft must be by decision of the aviation unit commander for specific conditions and loads.

b. Army Aircraft Characteristics (fig. 7-3).

Figure 7-3

[Located in back of manual]

c. Rotary-Wing Aircraft.

(1) *General.* Army rotary-wing aircraft (helicopters) are limited in speed and range as compared with fixed-wing aircraft. However, their ability to land and take off vertically permits the delivery of personnel and materiel to and the evacuation from areas of operations inaccessible to fixed-wing aircraft. Likewise, their capability for flight at relatively slow speeds permits continued operations under weather conditions of low ceiling and restricted visibility.

(2) *Planning factors (rotary-wing).* (See also FM 101-10-3, ch. 5, sec. V.)

(a) *Availability.* The number of helicopters available for a mission at any one time will depend on the status of maintenance and inspections on the helicopters in the unit. Experience indicates that about two-thirds (67%) of the helicopters assigned to a unit are available for

flying during continuous operations. Normally a higher percentage of assigned aircraft will be operational for missions of short duration, depending on variables such as previous operational commitments, status of maintenance and inspections, type aircraft, availability of repair parts, and operational environment.

(b) *Cargo.* The dimensions of cargo are restricted only by the size of the cargo compartment doors and/or the system used to carry the cargo externally—assuming, of course, that the weight of the package(s) does not exceed the weight limitations for the aircraft under prevailing conditions. Typical items of cargo for internal loading are boxes of rations, ammunition, signal equipment, vehicle and aircraft parts, and supplies. Loads too large to fit into the cargo compartment but under the maximum weight permissible for external loads may be carried slung under the helicopter to expedite loading and unloading.

1. UH-1A (Iroquois) (fig. 7-4).

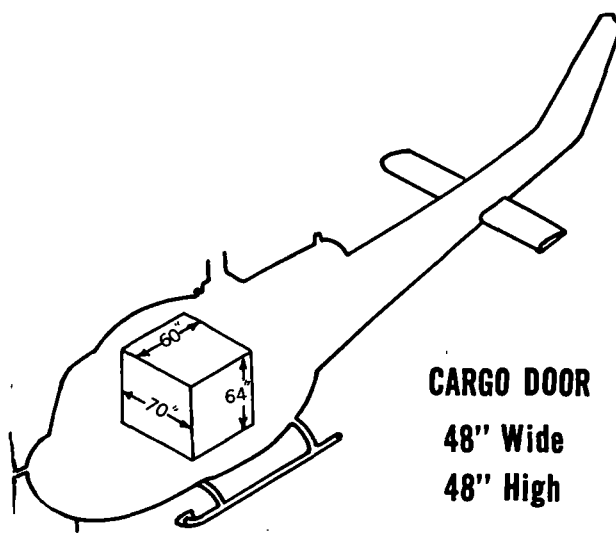


Figure 7-4

2. UH-1D (Iroquois) (fig. 7-5).

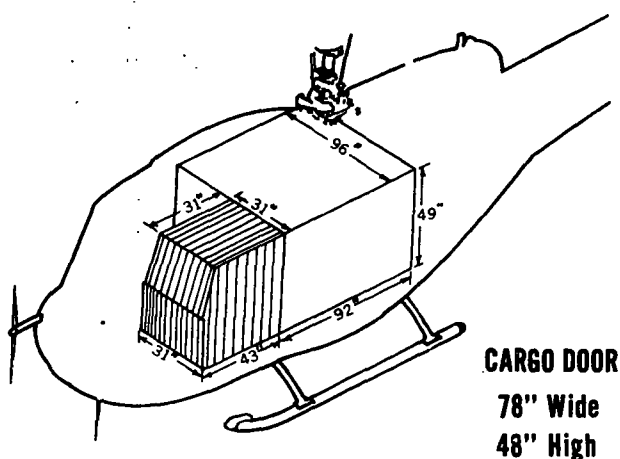


Figure 7-5

3. CH-34A (Choctaw) (fig. 7-6).

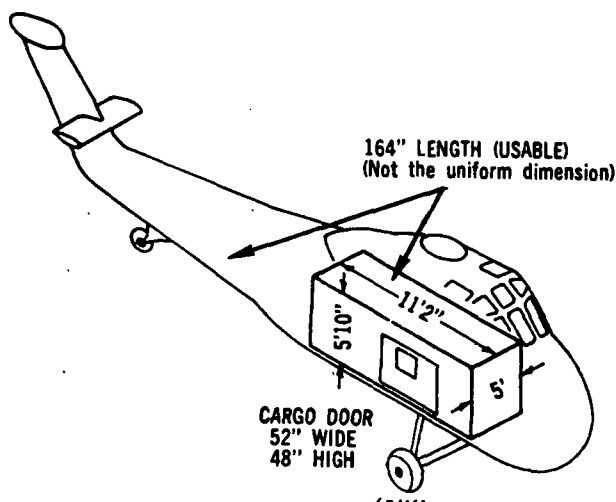


Figure 7-6

(c) **Landing facilities.** Provisions must be made for adequate landing sites when planning helicopter movements. The minimum requirements for landing sites are as follows. However, larger areas with cleared approaches are highly desirable to improve safety margins of operation.

OH-23, OH-13	-----	18 m x 18 m
UH-19, UH-1A	-----	28 m x 28 m
CH-21, CH-34	-----	28 m x 46 m
CH-37, CH-47	-----	46 m x 64 m

4. CH-37A (Mojave) (fig. 7-7).

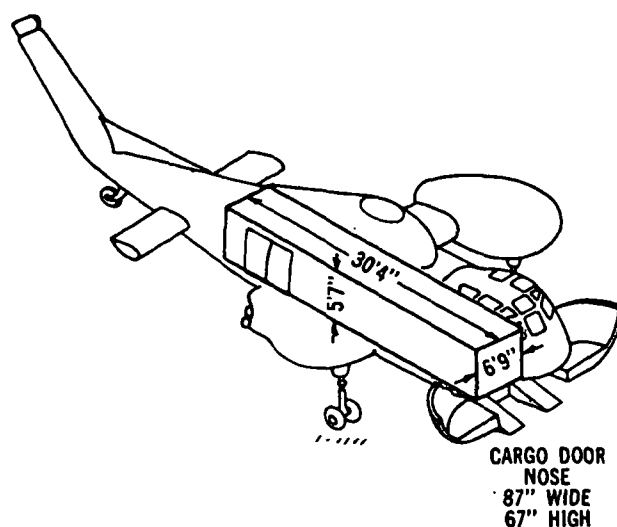


Figure 7-7

5. CH-47A (Chinook) (fig. 7-8).

5. CH-47 (Chinook)

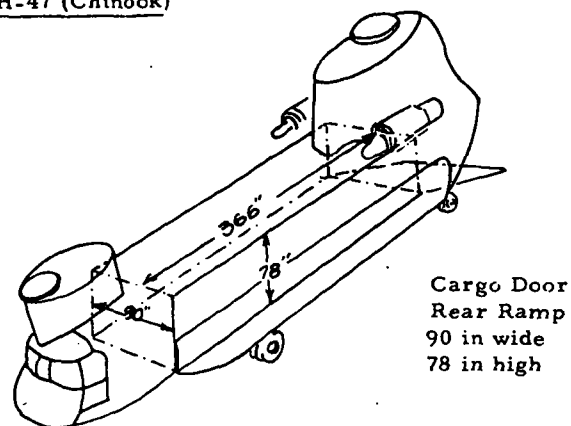


Figure 7-8

(d) **Maintenance.** Maintenance facilities should be provided at primary landing areas the minimum requirement being a sheltered area which will provide adequate shelter for organizational maintenance on the helicopters. For planning purposes, 7 organizational maintenance man-hours per flying hour may be considered average for the UH-19,

10.8 hours for the CH-21 and CH-34, 15.6 hours for the CH-37 and CH-47, and 6 hours for the UH-1A, B, D aircraft.

(e) *Hours of operation.* The average number of hours of operation per day for extended periods should not exceed daily equivalents of annual flying hours program contained in table IV, SB 1-1, for the type helicopter employed.

(f) *Loading and unloading time.* The factors given here are for planning purposes and presume the aircraft

has been properly prepared for the personnel or cargo that it is to transport. The times do not include palletizing general cargo for internal loading or rigging slings on cargo for external transport.

Personnel:

Troops ----- 3 minutes

Casualties ----- 10 minutes

Cargo internal in fuselage:

Single vehicles ----- 5 minutes

Vehicles with trailers... 15 minutes

Palletized cargo (by hand)

20 minutes

Cargo suspended beneath helicopter:

Hookup time only ----- 30 seconds

(g) *Payload guidance.*

	1	2	3	4	5	6
1	Model	Per aircraft ¹				
		Aircraft per company	Troop ² capacity	Recommended payload (lbs)	Litter ² capacity	True airspeed (knots)
2	UH-19D	-----	3	800	3	85
3	UH-1A	-----	6	1,968	2 + 1 Ambulatory	60
4	UH-1B	25	8	2,505	3 + 1 Ambulatory	102
5	UH-1D	25	8	2,115	6 + 1 Ambulatory	94
6	CH-21C	20	10	2,401	10	67
7	CH-34C	16	15	3,790	8	104
8	CH-37B	16	23	6,512	24	86
9	CH-47A	16	33	11,105	24 + 3 Ambulatory	130

¹ Computed at 60°F, no wind, and at sea level. Based on full internal fuel and 2 crewmen in the UH-19D, UH-1A, UH-1B, UH-1D and CH-21C, and 8 crewmen in CH-34C, CH-37B, and CH-47A.

² Computed at 240 lbs per individual. Actual troop seats or litter spaces are in some cases greater than capacity shown. This is due to the payload resulting from the conditions imposed in Note ¹ above.

Further reduction in payload is required for temperatures above 60°F, and when operating at higher elevations. The payload reduction required for a specific mission is determined from the Technical Manuals 55-series-10, for the respective aircraft. When distances permit payload may be increased by removal of unnecessary fuel.

(h) *Determination of transport helicopter requirements.*

1. Most helicopter operations will be of the short-haul type and may require that more than one round trip (sortie) be flown in support of the movement.
2. To determine the number of helicopters or units required to accomplish a given mission or the capabilities of helicopters on a specific mission, the staff planner should use the following formulas:

$$N = \frac{HS}{D}, \text{ when}$$

N = Number of round trips (sorties per aircraft per day). This figure must be the resultant next lower whole number if a fraction is involved; a sortie must complete a round trip.*

S = Average sortie speed of aircraft in knots. For planning purposes, use cruising speed unless some other speed is specified.

D = Round trip distance in nautical miles. This distance must be the actual distance flown rather than airline distance from origin to destination. If airline distance is used, add 15 percent to the airline distance to obtain estimated flight distance.

H = Represents the number of operational hours available.

$$O = \frac{T}{N \times P}, \text{ when}$$

O = Number of operational aircraft required or available daily.

T = Tonnage to be moved or tonnage that can be moved.

P = Payload of type aircraft used.

$A = 1.5 \times O$, when

A = The number of aircraft required or available to carry out a sustained operation. (This formula applies the daily availability factor of 67 percent to O to obtain A or to A to obtain O .)

* If service and fuel are available at both pickup and delivery points, one-half sortie can be computed as a lift. (A lift is the movement of a load from origin to destination.) This would require the helicopters to remain in the delivery point area for service, which is normally undesirable.

3. This method of determining helicopter requirements is particularly applicable to movement of supplies or troops when combat loading is not a factor to be considered. Aircraft for air-landed assault operations should be determined by the preparation of a planning worksheet. The planning worksheet develops loads to provide for tactical integrity of the combat units and combat loading of each aircraft. The method of determining aircraft requirements described herein can be used to *estimate* requirements for assault operations by adding 10 percent to the unit personnel and equipment tonnage to allow for combat loading.

4. *Examples.*

- (a) A division has been allocated 18 CH-34 helicopters for a period of 3 days to assist in moving supplies from the field army supply points to the division distributing points. The round trip actual flight distance is 80 nautical miles. The division G4 desires to know what the daily lift capacity of this helicopter company will be for this mission.

Solve first for N (number of sorties per aircraft per day):

$$N = \frac{HS}{D}, \quad N = \frac{4 \times 104}{80},$$

$$N = 5.2 \text{ or } 5 \text{ sorties per day}$$

Solve next for O (number of operational aircraft available):

$$O = 67 \text{ percent of } A \text{ (18)}, \quad O = 12 \text{ operational aircraft per day.}$$

Solve for T (daily tonnage capability of available aircraft):

$$O = \frac{T}{N \times P}, \quad 12 = \frac{T}{5 \times 1.89},$$

$$T = 113.4 \text{ short tons per day.}$$

- (b) The field army G4 has a requirement to move 300 short

tons of cargo per day for 8 days from the field army service area to the 20th Infantry Division. Because of terrain and enemy action, this movement cannot be made by surface means. The G4 is computing the number of CH-34's and/or helicopter companies that will be required to accomplish this mission. The estimated flight distances from the field army service area to the 20th Infantry Division distributing points is 28 nautical miles.

$P = 1.89$ short tons.

$T = 300$ short tons.

$S = 104$ knots.

$D = 56$ nautical miles (round trip distance).

$N = \frac{4 \times 104}{56}$, $N = 7.4$ or 7 (sorties per aircraft).

$O = \frac{300}{7 \times 1.89} = O = 22.6$ or 23 (helicopters).

$A = 1.5 \times 23$, $A = 35$ helicopters or approximately 2 companies of CH-34 helicopters.

d. Fixed-Wing Aircraft.

(1) *General.* Army fixed-wing aircraft are limited in speed and range as compared with larger transport-type aircraft. The ability of Army fixed-wing aircraft to land and take off from selected small, unprepared areas permits the delivery of personnel and material to and the evacuation from areas of operations inaccessible to larger aircraft. The ability of Army fixed-wing aircraft to fly slowly and maintain a high degree of maneuverability further enhances their value in forward areas under combat conditions.

(2) *Planning factors (fixed-wing).* (See also FM 101-10-3, ch. 5, sec. V.)

(a) *Availability.* The operation plan should be based on the availability of 75 percent of the assigned aircraft for sustained operations. A higher availability ratio of approximately 95 percent may be obtained for operations of short duration (less than 6 days). This higher availability ratio will depend on the status of maintenance and inspections, repair parts, time available for maintenance, and degree of skill of maintenance personnel.

(b) Cargo.

1. Cargo may be delivered by four means: free-fall, parachute, air-landed, or low level extraction. The type of delivery utilized is normally requested by the receiving unit. The size and amount of cargo which may be loaded internally will be governed by the following:

(a) Size of compartment door.

(b) Compartment door location with respect to the cargo compartment.

(c) Size of cargo compartment.

(d) Lifting capability of the aircraft used.

2. U-6A (Beaver) (fig. 7-9).

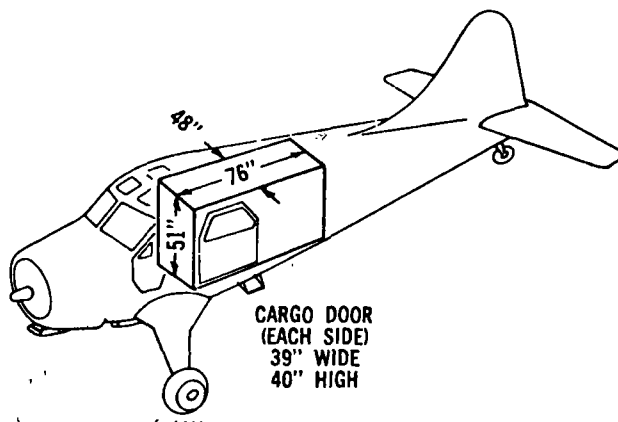


Figure 7-9

3. U-1A (Otter) (fig. 7-10).

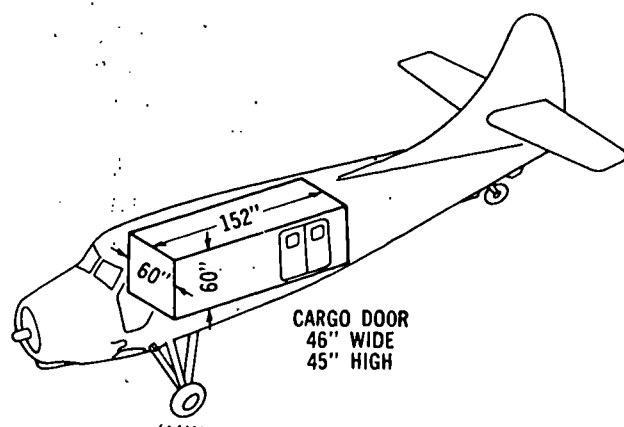


Figure 7-10

4. CV-2B (Caribou) (fig. 7-11).

4. CV-2B (Caribou)

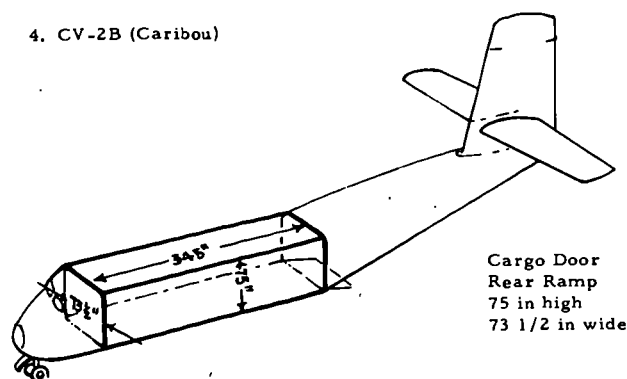


Figure 7-11

- (c) *Landing facilities.* The development of a landing area adequate for prolonged operations or for accommodation of frequent traffic is a continuous operation. Provisions must be made for an adequate area when planning aircraft movements. The minimum requirements for landing areas are as follows:

1	1	2	3
	Aircraft at maximum gross weight	No wind conditions at sea level over 15 meter obstacle	
		Length (meters)	Width (meters)
2	O-1A -----	250	15
3	U-6A -----	370	20
4	U-8D -----	760	20
5	U-1A -----	460	20
6	CV-2A -----	*300	30
7	OV-1A -----	*900	20

1 Maximum takeoff configuration.

* Most critical configuration.

- (d) *Maintenance.* Under normal climatic conditions, no extensive facilities are required for organizational maintenance. Special equipment and facilities will be required when operating in extreme climatic conditions. Direct support field maintenance units are equipped for field

operations under normal climatic conditions. Special considerations for equipment and facilities will be required under extreme conditions. For man-hour requirements for aircraft maintenance, applicable publications should be consulted.

- (e) *Hours of operation.* Based on a sustained operation, average flying hours per airplane should not exceed the daily equivalent of annual flying hours program contained in table IV, SB 1-1.

- (f) *Loading time.*

Personnel:

Troops—approximately 2 to 3 minutes (dependent on type aircraft).

Casualties—10 minutes.

Cargo:

Internal in fuselage—dependent on type cargo, 10 to 30 minutes.

External beneath wings of airplane—approximately 10 minutes.

- (g) *Unloading time.*

Personnel:

Troops—1 minute.

Casualties—10 minutes.

Cargo:

Internal in fuselage — approximately 5 minutes.

External — air-landed — 10 minutes.

Parachute—30 seconds.

Free-fall—10 seconds.

(h) Payload guidance.

	1	2	3	4	5	6
		Per aircraft ¹				
1	Model	Aircraft per company	Fully equipped troops ²	Recommended payload lbs	Litter patients ³	Average cruising speed (knots)
2	U-6A	-----	4	972	2 plus 2 ambulatory	105
3	U-1A	16	10	2,500	2 + 2	100
4	CV-2B	16	18	4,356	18	150

¹ Computed at 60°F, no wind at sea level.

² Based on full internal fueled tanks with one crewman in U-6A and U-1A, and 8 crewmen in CV-2B.

³ Computed at 240 lbs per individual. Troops and litter patients may be increased by reducing fuel load.

- (i) Determination of aircraft requirements. See c(2) (h) above.

7-43. Air Force Transport Aircraft

a. For general considerations and procedures governing the employment of Air Force transport aircraft in joint operations, see FM's 100-5; 101-5; 57-30; 57-100; and 101-10-3, chapter 5, section V.

b. In planning for joint airborne operations, the commander and staff officer should be familiar with the following basic terms:

- (1) **Allowable cargo load (air).** The weight of cargo in pounds which can be loaded into an aircraft for a specific mission. In an airborne operation, the Air Force commander will announce the allowable cargo load for each type of aircraft. The allowable cargo load of an aircraft varies according to distance and certain other conditions. The greater the distance, the greater the weight of fuel and re-

sultant reduced allowable cargo load. In radius operations, the allowable cargo load for the distance traveled for parachute operations may be greater than that for air-landed operations because there is a necessary safety restriction on the total weight of the aircraft on landing. The allowable cargo load for an aircraft can be determined for any range or radius by reference to graphs provided for that purpose.

- (2) **Radius of action.** The maximum distance to which an airplane can safely travel and return without refueling. Operations under radius conditions are those in which aircraft deliver troops or materiel at a destination and return without refueling.
- (3) **Range.** The distance from the takeoff point to the point where an airplane delivers its cargo load (safety margin of reserve fuel included). Refueling is required to return to the original takeoff point.

c. A general description of the various types of military aircraft and their technical characteristics and performance data, to include cargo-distance graphs; cargo compartment dimensions; troop transport, litter transport, parachutists, and aerial delivery provisions, are contained in TM 57-210.

d. Planning data for determining Air Force transport aircraft requirements for movement of units of a type field army are contained in paragraph 4-12.

e. The following data are included for use as a guide to commanders and staff officers in computing type load requirements for airlifting Army aircraft in Air Force transport aircraft. Total requirements of Air Force transport aircraft necessary to lift complete TOE units may be determined by combining aircraft requirements based on the data below with the tabulated requirements for the aviation unit concerned in paragraph 4-12. The allowable cargo loads for Air Force aircraft used in

determining the number of Army aircraft each can transport are those shown in paragraph 4-12b (3) and a 60,000-pound allowable cargo

load for the C-133, heavy transport airplane. Space, however, rather than weight is the critical factor.

Type Loads for Airlifting Army Aircraft

1	2	3	4	5	6
1	Air Force transport aircraft	Army aircraft		Total load ¹	
		Type	No. Degree of disassembly	Pounds	Short tons
2	C-119	O-1	2 Wings, elevators, and vertical fin -----	3,718	1.9
3	C-123	O-1	1 Wings, elevators, and vertical fin -----	3,718	1.9
4	C-124	O-1	2 Wings -----	5,577	2.8
5	C-124	O-1	4 Wings, elevators, and vertical fin -----	7,437	3.7
6	C-130	O-1	2 Wings, elevators, and vertical fin -----	3,718	1.9
7	C-133	O-1	3 Wings -----	5,577	2.8
8	C-133	O-1	4 Wings and elevators -----	9,296	4.7
9	C-119	U-6	1 Wings, elevators, main and tail landing gear, propeller, and all antennas -----	3,527	1.8
10	C-123	U-6	1 Wings, elevators, main and tail landing gear, propeller, and all antennas -----	3,527	1.8
11	C-124	U-6	2 Wings, elevators, and reduce landing gear width to 118" -----	7,056	3.5
12	C-130	U-6	1 Wings, elevators, and reduce landing gear width to 113" -----	3,527	1.8
13	C-133	U-6	4 Wings, elevators, and fuselage-to-leg fairings -----	14,112	7.1
14	C-119	U-1A	(^a) -----		
15	C-123	U-1A	(^a) -----		
16	C-124	U-1A	Wings, elevators, propellers, and landing gear -----	10,752	5.4
17	C-130	U-1A	1 Wings, elevators, propellers, and landing gear -----	5,376	2.7
18	C-133	U-1A	2 Wings, elevators, propellers, and landing gear -----	10,752	5.4
19	C-119	OH-13	1 Blades and main rotor mast assembly -----	1,893	0.9
20	C-123	OH-13	1 Blades and main rotor mast assembly -----	1,893	0.9
21	C-124	OH-13	2 One main rotor blade (two) -----	3,786	1.9
22	C-130	OH-13	2 Main rotor blade and mast (one) and one main rotor blade (one) -----	3,786	1.9
23	C-133	OH-13	2 One main rotor blade and whip antenna (two) -----	3,786	1.9
24	C-133	OH-13	5 One main rotor blade and whip antenna -----	9,465	4.7
25	C-119	UH-19	1 Head, blades, landing gear, and tail cone -----	6,382	3.2
26	C-123	UH-19	1 Head, blades, landing gear, and tail cone -----	6,382	3.2
27	C-124	UH-19	2 Head, blades, and tail cone -----	12,764	6.4
28	C-130	UH-19	2 Head, blades, landing gear, and tail cone -----	12,764	6.4
29	C-133	UH-19	2 Head and blades -----	12,764	6.4
30	C-133	UH-19	4 Head, blades, and tail cone -----	25,528	12.8
31	C-119	CH-21	(^a) -----		
32	C-123	CH-21	(^a) -----		
33	C-124	CH-21	1 Blades and landing gear; body in two sections -----	10,416	5.2
34	C-130	CH-21	(^a) -----		
35	C-133	CH-21	1 Head, blades, and landing gear -----	10,416	5.2
36	C-119	OH-23	1 Blades and mast -----	2,016	1.0

See footnotes at end of table.

1	Air Force transport aircraft	2		3		4		5		6	
		Type	No.	Army aircraft		Degree of disassembly		Total load ¹		Ponnds	Short tons
37	C-123	OH-23	1	Blades and mast -----				2,016		1.0	
38	C-124	OH-23	2	One main rotor blade, both control blades, and antennas -----				4,032		2.0	
39	C-130	OH-23	2	Head and blades -----				4,032		2.0	
40	C-133	OH-23	2	One main rotor blade and antenna -----				4,032		2.0	
41	C-133	OH-23	4	One main rotor blade (four) and antennas -----				8,064		4.0	
42	C-133	OH-23	5	One main rotor blade (five) and antennas -----				10,080		5.0	
43	C-119	CH-34		(²) -----							
44	C-123	CH-34		(²) -----							
45	C-124	CH-34	2	Heads, blades, landing gear, tail pylon and canopy assembly -----				17,987		9.0	
46	C-130	CH-34		(²) -----							
47	C-133	CH-34	2	Heads, blades, landing gear, tail pylon and canopy assembly -----				17,987		9.0	
48	C-119	UH-1		(²) -----							
49	C-123	UH-1	1	Blades, landing gear, pylon stabilizers, main rotor mast, tailpipe fairing, transmission cowling (2 halves), tail rotor blade, tail cone, and all antennas -----				4,333		2.2	
50	C-124	UH-1	2	For UH-1A: (from each helicopter) one main rotor blade, stabilizer bar from main rotor head; synchronized elevator, one tail rotor, antennas. For UH-1B and UH-1D: antennas, stabilizer bar assembly, hub assembly, main rotor blades, mast and swashplate assembly, one tail rotor blade, and synchronized elevators -----				8,666		4.3	
51	C-130	UH-1	1	For UH-1A: main rotor blades, head and mast, one tail rotor, synchronized elevator, and all antennas. For UH-1B and UH-1D: antennas, main blades, tail rotor blade, mast and swashplate assembly, synchronized elevators, exhaust cowling, and exterior mirror -----				4,333		2.2	
52	C-133	UH-1	3	For UH-1A: One main rotor blade, one tail rotor blade, all antennas, and synchronized elevator. For UH-1B and UH-1D: All antennas, leading main rotor blade, synchronized elevators, and exterior mirror, additionally, for helicopters loaded forward of the wing spar, remove both main rotor blades, and mast and swashplate assembly -----				12,999		6.5	

¹ Includes an estimated 240 pounds per ton of aircraft for crating and cradling materials.

² Degree of disassembly required to transport in this aircraft is uneconomical.

Section VIII. INLAND WATERWAYS

7-44. General

a. *Types.* Inland waterways include all navigable inland waters such as rivers, lakes, inland channels, and canals of sufficient depth to accommodate cargo traffic. The following are

the general types into which inland waterways are grouped:

- (1) Lakes.
- (2) Rivers.
- (3) Ship canals.

- (4) Barge canals.
- (5) Intracoastal waterways.

b. Characteristics. The characteristics of a waterway which must be considered in an analysis of its capabilities are as follows:

- (1) Restricting widths and depths of channel.
- (2) Vertical and horizontal bridge clearance.
- (3) Location of dams and other bars to navigation.
- (4) Location of locks, dimensions, and timing.
- (5) Seasonal floods and droughts, their frequency and duration.
- (6) Normal freezeup and opening dates.
- (7) Hazards to navigation, such as rapids and falls.
- (8) Speed and fluctuation of current.
- (9) Waterway maintenance requirements.
- (10) Changes of channel.

7-45. Waterway Capacity Estimates

a. Limiting Factors. Factors, other than waterway characteristics, having a limiting effect on waterway capacity are—

- (1) Availability of suitable barges or craft.
- (2) Availability of suitable operating personnel.
- (3) Availability and adequacy of terminals and terminal facilities.

b. Turnaround Time. This factor is defined as the time required for a barge or craft to load, travel to destination, unload, return to origin, and be ready to resume loading. It has considerable effect on waterway capacity and involves—

- (1) Length of haul, taken as round-trip distance.
- (2) Speed in still water—4 miles per hour.
- (3) Speed and direction of current.
- (4) Loading and unloading time—computed at 8.4 short tons per barge per hour.
- (5) Time consumed in locks.
- (6) Operating hours per day—normally taken as 20, allocating the remaining

four for maintenance, refueling, restoring, etc.

c. Capacity Determination, Craft Available to Fill or Exceed Waterway Capacity. When sufficient barges or craft are available to fill or exceed waterway capacity, the daily tonnage that may be moved over the waterway is equal to one-half the number of craft per day that can be passed through the most limiting constriction (*for example*, a lock, lift bridge, narrow channel, etc.) times the average net capability of the craft in use.

d. Capacity Determination, Craft not Available to Fill or Exceed Waterway Capacity. The following formula may be used to determine the number of tons a given number of barges can transport a given distance daily:

$$\frac{\text{Number of barges} \times \text{tons per barge} \times \text{hours of operation per day}}{\text{Turnaround time in hours}} = \text{Tons moved daily.}$$

Example: Determine the daily tonnage 20 barges of 270 short tons capacity each can move 60 miles forward with no lost time in locks and negligible effect due to current—

$$\text{Travel time per barge} = \frac{60 + 60}{4} = 30 \text{ hours.}$$

$$\text{Loading and unloading time per barge} = \frac{2 \times 270}{8.4} = 64.3 \text{ hours.}$$

$$\text{Turnaround time per barge} = 30 + 64.3 = 94.3 \text{ hours.}$$

$$\frac{20 \text{ barges} \times 270 \text{ tons per barge} \times 20 \text{ hours daily availability}}{94.3 \text{ hours turnaround time}} = 1,145.3 \text{ short tons daily.}$$

7-46. Floating Equipment Requirements

a. Cargo Craft. To determine the number of barges or cargo craft required to move a given tonnage a given distance forward daily, use the following formula:

$$\frac{\text{Daily tonnage} \times \text{hours turnaround time}}{\text{Tons per barge} \times \text{hours of operation daily}} = \text{Number barges required.}$$

Example: Determine the number of barges having a capacity of 500 short tons required to move 1,000 short tons daily a distance of 100 miles forward, assuming no lost time in locks and negligible effect due to current.

$$\text{Travel time per barge} = \frac{100 + 100}{4} = 50 \text{ hours.}$$

$$\text{Loading and unloading time per barge} = \frac{2 \times 500}{8.4} = 119 \text{ hours.}$$

$$\text{Turnaround time per barge} = 50 + 119 = 169 \text{ hours.}$$

$$\frac{1,000 \text{ tons daily} \times 169 \text{ hours turnaround}}{500 \text{ tons per barge} \times 20 \text{ hours daily operation}} = 16.9 \text{ barges} = 17 \text{ barges required.}$$

b. Tugs and Towboats. Since a single tug or towboat can normally be used to tow more than one barge and since loading time is not a con-

sideration in tug or towboat availability, it follows that fewer tugs than barges will be required in any given situation. To determine the number of tugs or towboats required to efficiently operate a given number of barges in a given situation, use the following formula:

$$\frac{\text{Total number of barges} \times \text{turnaround time for tugs in days}}{\text{Number of barges per tow} \times \text{turnaround time for barges in days}} = \text{Number of tugs.}$$

Example: Determine the number of tugs required to operate 400 barges, when each tow consists of five barges, turnaround time for barges is 4 days, and turnaround time for tugs is 2 days.

$$\frac{400 \text{ barges} \times 2 \text{ days tug turnaround}}{5 \text{ barges per tow} \times 4 \text{ days barge turnaround}} = 40 \text{ tugs required.}$$

Section IX. OCEAN SHIPPING

7-47. Definition of Ship-Loading Terms

a. Units of Weight.

- (1) Short ton (STON)—2,000 pounds.
Used by U.S. ships in domestic trade.
- (2) Long ton (LTON)—2,240 pounds.
Used by U.S. ships in foreign trade.
- (3) Metric ton—2,205 pounds.
Used by foreign shipping.

b. Units of Volume.

- (1) Measurement ton (MTON)—40 cubic feet. Used by U.S. ships in foreign trade.
- (2) Register ton—100 cubic feet. (This tonnage is used for working out a basis to collect entry fees for the vessel and has no direct bearing on the cargo-carrying capacity of the vessel.)

c. Units of Distance and Speed.

- (1) *Distance*—nautical mile = 6,080 feet.
- (2) *Speed*—knot = 1 nautical mile per hour.

d. Gross Tonnage. Gross tonnage (gross reg-

ister tonnage) is the entire internal cubic capacity of a ship expressed in register tons of 100 cubic feet each.

e. Net Tonnage. Net tonnage (net register tonnage) of a ship represents the cargo and passenger-earning spaces which remain after deduction from the gross tonnage of space for the crew, powerplant, fuel, and operation of the vessel. Net tonnage is expressed in tons of 100 cubic feet each.

f. Deadweight Tonnage. Deadweight tonnage is the carrying capacity of a ship expressed in long tons and represents the difference between displacement loaded to maximum draft allowed by law and displacement light.

g. Displacement Tonnage Light. Displacement tonnage light is the weight of a ship in long tons and excludes the weight of cargo, passengers, fuel, water, stores, dunnage, and such other items necessary for use on a voyage.

h. Displacement Tonnage Loaded. Displacement tonnage loaded is the weight of a ship in long tons and includes the weight of cargo,

passengers, fuel, water, stores, and such other items necessary for use on a voyage.

i. *Cargo Deadweight Tonnage.* Cargo deadweight tonnage is the weight-lifting capacity of a ship in long tons remaining after deducting from the deadweight tonnage the weight of fuel, water, stores, dunnage, and such other items as may be necessary for a voyage.

j. *Grain Cubic Capacity.* Grain cubic capacity is the maximum space available for cargo measured in cubic feet, the measurements being taken to the inside of the shell plating of the ship or to the outside of the frames and to the top of the beams or underside of the deck plating. If a bulk cargo of grain was loaded, it would flow in between the frames and beams and occupy the maximum space available. This is the grain cubic capacity.

k. *Bale Cubic Capacity.* Bale cubic capacity of a ship is the number of cubic feet of space available for cargo measured to the inside of the cargo battens, on the frames, and to the underside of the beams.

l. *Lost Space.* Lost space (broken stowage, stowage loss) is the difference between the ship's cubic measurement and total measurement of the cargo. Although allowance for lost space varies a great deal with individual types of cargo, the average allowance for the entire spread of military cargo amounts to the following, which is given in percentage of bale cubic capacity:

	Percentage
(1) Administrative loading -----	20
(2) Commodity loading -----	30
(3) Combat loading -----	50
(4) Selective loading -----	30

m. *Stowage Factor.* A stowage factor is a relationship of cubage to weight. As applied to cargo, it is the ratio of the number of cubic feet of space occupied by the cargo to the weight of the cargo in long tons. The units in which a stowage factor is expressed are stated as "cubic feet per long ton." In individual items or types of cargo, it is the amount of cubic feet of space occupied by 1 long ton.

n. *Vessel Stowage Factor.* Vessel stowage factor = (bale cubic capacity—estimated lost

space) ÷ (cargo deadweight tonnage—estimated weight of deck cargo).

- (1) To determine whether weight or volume of a specific commodity will be the limiting factor in loading a Liberty-type ship of 400,000 cubic feet capacity after deducting lost space and with a cargo capacity tonnage (less deckload) of 8,000 long tons.

$$\begin{aligned}\text{Vessel factor} &= \frac{400,000 \text{ cubic feet}}{8,000 \text{ long tons}} \\ &= 50 \text{ cubic feet/long tons}\end{aligned}$$

- (2) Under the conditions stated above, the vessel will have its cargo space completely filled and its weight capacity utilized if stowed with cargo occupying 50 cubic feet to the long ton. In this example, for cargo occupying more than 50 cubic feet per long ton, volume will be the limiting factor. For cargo occupying less than 50 cubic feet per long ton, weight will be the limiting factor.

7-48. Shipping References

FM 60-30, *Embarkation and Loading Amphibious* (1962).

7-49. Commercial Loading Methods

a. *Bulk and General Cargo Loading.* Bulk and general cargo loading is the stowage of supplies to utilize the entire carrying capacity of a ship, disregarding segregation of cargoes either by class, technical service, or commodity. It permits maximum economy in shipping space but requires additional labor and facilities at destination for segregation and assembly of supplies for use.

b. *Multiple Port Discharge.* Multiple port discharge utilizes bulk stowage of supplies for more than one destination, loaded to maintain availability for discharge of proper items in the order of arrival at the ship's scheduled destinations.

7-50. Military Loading Methods

Military cargo is loaded on board ships ac-

according to its intended employment at its destination. There are four distinct types of military loading.

a. Combat Loading. Combat loading gives primary consideration to the facility with which troops, equipment, and supplies can be unloaded and ready for combat on landing, rather than to economical utilization of ship space. There are three methods of combat loading. They differ mainly as to the degree of availability of troop units for landing and as to the tactical integrity of the units.

- (1) *Combat unit loading.* Combat unit loading is the loading of an assault troop unit, together with its essential combat equipment and supplies, in a single ship in such a manner that the unit will be available to support the tactical plan upon debarkation and to provide for maximum of flexibility to meet possible changes in the tactical plan.
- (2) *Combat organizational loading.* Combat organizational loading is the loading of a troop unit with its equipment and supplies on the same ship, in such a manner as to be available for unloading in a predetermined order. It permits debarkation of complete units and equipment which are available for employment after assembly ashore. This method is more economical in ship space than combat unit loading.
- (3) *Combat spread loading.* Combat spread loading is the loading of some of the troops, equipment, and initial supplies of a unit on one ship and the remainder on one or more ships. This

method is commonly used with troop units with heavy equipment. Units so loaded are available for employment when landed at established beachheads or ports after a lapse of time necessary to assemble them on land with their equipment and supplies.

b. Administrative Loading. Administrative loading is a method of loading troops and/or equipment and supplies in a ship for maximum utilization of personnel and cargo space. No consideration is given to debarkation priorities. Therefore, equipment and supplies must be unloaded and sorted before they can be used. This type loading may be employed effectively for reinforcing and maintaining an expeditionary force and for carrying supplies and equipment for the buildup forces.

c. Commodity Loading. Commodity loading is a method of loading in which various types of cargo, such as ammunition, rations, or boxed vehicles, are loaded together in order that each commodity can be discharged without disturbing the others.

d. Selective Loading. Selective loading is the arrangement and stowage of equipment and supplies aboard a ship in a manner designed to facilitate issue to units. Specific items may be discharged on call.

7-51. Nomenclature of Maritime Commission Oceangoing Vessels

Note. There is such a large difference in the cubic-carrying capacity of vessels of the same type, because of various alterations and special fittings, that the cubic feet and tonnage figures shown in the tables in this paragraph and in paragraph 7-52 are, in most instances, minimum and apply to one type of the designated vessels only.

1	2	3
	Deadweight tonnage	Remarks
1	Type	
2	B7	Concrete hull, cargo barge, nonpropelled.
3	C1-A	Designed for general cargo in world trade; steam turbine and motor-propelled (two modifications).
4	C1-B	Designed for general cargo in world trade; steam turbine and motor-propelled (three modifications).
5	C1-M	Designed for general cargo; motor-propelled.
6	C1-S	Concrete ship designed for cargo purposes; steam-reciprocating-engine propelled.

1	2	3
Type	Deadweight tonnage	Remarks
7 C2	9,300	Designed for general cargo in world trade; majority steam-turbine propelled (several modified types). Modified types were used mostly as hospital ships in World War II.
8 C3	9,900	Combination passenger and cargo ship; majority steam-turbine propelled (several modified types).
9 C3-S	12,300	Designed for cargo; steam-turbine propelled.
10 C4	15,000	Designed for cargo; steam-turbine propelled (two modifications).
11 C4-S-1a	12,900	Mariner class vessel. Developed by Maritime Administration in cooperation with the Department of Defense to provide modern high-speed commercial-type vessels which can readily be converted for wartime shipping.
12 EC2	10,800	Liberty-type designed for general cargo; steam-reciprocating-engine propelled. Several modified types, prefixed by the symbol Z, were designed as tank carriers and later modified as plane carriers.
13 L6	15,700	Specially designed for bulk ore, coal, or grain trade on the Great Lakes; steam-reciprocating-engine propelled.
14 N3	2,800	Cargo carrier designed for coastal trade; steam-reciprocating-engine propelled.
15 P1	1,900	Specially designed passenger-type vessel; steam-turbine propelled.
16 P2	10,000-12,000	Designed to carry troops. Two types, one turbine-electric propelled, one steam-turbine propelled.
17 T1	1,500-4,200	Designed for tanker service in coastal and inland waters; diesel-propelled (four modifications).
18 T2	16,000	Designed to carry bulk oil in world trade; turbo-electric propelled (four modifications).
19 T3	16,500	Designed to carry bulk oil in world trade; steam-turbine propelled (six modifications).
20 V4	800	Large diesel-powered oceangoing tug.
21 VC2	10,200	Victory-type designed to carry cargo in world trade. Four types: one has 6,000 HP engine; three have 8,500 HP engines. Three are steam-turbine propelled; one diesel-propelled.

7-52. Cargo Vessel Characteristics

a. Physical Characteristics.

1	2	3	4	5	6	7
Vessel	Gross register tonnage	Overall length (ft)-(m)	Beam (ft)	Sustained speed (knots)	Cruising range (nautical mile)	Summer draft (ft)-(m)
2 Liberty.....	7,100	442-135	57	11.0	19,000	28-8.5
3 Victory.....	7,600	455-139	62	15.5	23,000	29-8.8
4 C1-B Cargo.....	6,700	418-127	60	14.0	24,000	28-8.5
5 C2 Cargo.....	6,181	459-140	63	15.0	16,000	26-7.9
6 C3 Cargo.....	7,900	492-150	70	16.5	11,700	29-8.8
7 C4 Cargo.....	10,780	520-158	71	17.0	9,000	33-10.0
8 FS Freighter ²	560	176-54	32	12.0	4,000	12-3.6
9 C1-M-AV1 Freighter.....	3,805	339-103	50	11.0	25,000	21-6.4
10 T2-SE Tanker.....	10,200	524-160	68	14.5	12,600	30-9.1
11 ZET 1 Tanker ³	7,000	442-135	57	11.0	17,000	28-8.5
12 C4 Mariner.....	9,200	564-172	76	20.0	23,000	30-9.1

¹ Cruising range can be increased to 18,000 miles if deep tanks are used for fuel oil. See footnote 2 in c below.

² FS type (freight service ship) is the 176-foot vessel built for the Army. It is an oceangoing vessel but, because of its small capacity, is used principally as an interisland carrier.

³ Converted Liberty.

b. Hold, Hatch, and Boom Data.

	1	2	3	4	5	6
1	Vessel	Cargo holds (number)	Boom capacity (LTON)	Booms (number)	Capacity heavy lift rigs (LTON)	Hatches with heavy lift booms (number)
2	Liberty-----	5	5	12	¹ 50-15	2-4
3	Victory-----	5	5	16	¹ 50-30	¹ 3-4
4	C1-B Cargo-----	5	5	15	30	2
5	C2 Cargo-----	5	5	17	50	3
6	C3 Cargo-----	5	5-10	21	30	5
7	C4 Cargo-----	7	5	24	50	4-5
8	FS Freighter ² -----	2	5	5	15	2
9	C1-M-AV1 Freighter-----	4	³ 3-5	12	30	2-3
10	C4 Mariner-----	7	5-10	26	60	4-6

¹ Some Libertys have a 30-ton boom at No. 2 hatch and a 15-ton boom at No. 4 hatch. Other Liberty ships have a 50-ton boom at No. 2 hatch and a 30-ton boom at No. 4 hatch. All Victories have a 30-ton boom at No. 4 hatch.

² FS type (freight service ship) is the 176-foot vessel built for the Army. It is an oceangoing vessel but, because of its small capacity, is used principally as an interisland carrier.

³ Two 3-ton booms (No. 4 hatch) and ten 5-ton booms.

c. Vessel Capacities.

	1	2	3	4	5	6	7
1	Vessel	Deadweight (LTON)	MTON ^{1,2}	Bale cubic capacity (cu ft) ^{1,2}	Grain cubic capacity (cu ft) ¹	Refrg cargo (cu ft)	Liquid cargo (hhl)
2	Liberty-----	10,800	11,886	475,444	563,257	-----	-----
3	Victory-----	10,800	11,413	456,525	528,325	-----	-----
4	C1-B Cargo-----	9,100	11,300	452,000	508,000	-----	-----
5	C2 Cargo-----	9,250	11,823	472,935	548,560	-----	-----
6	C3 Cargo-----	12,300	18,425	736,980	815,470	³ 45,000	-----
7	C4 Cargo-----	14,863	17,790	672,240	727,430	⁴ 32,375	-----
8	FS Freighter-----	470	483	19,320	21,462	-----	-----
9	C1-M-AV1-----	5,032	5,699	227,930	250,000	9,830	4,000
10	T2-SE Tanker-----	16,583	381	15,230	-----	-----	141,000
11	ZET-1 Tanker ⁵ -----	10,800	-----	-----	-----	-----	65,000
12	Supertanker ⁶ -----	25,000	-----	-----	-----	-----	165,000
13	C4 Mariner-----	12,900	18,418	736,723	837,305	30,254	-----

¹ On-deck space or lost space in stowage not included.

² Does not include capacity of deep tanks of which the Liberty-type ship has three. Deep tanks No. 1 and No. 2, with approximately 16,000 cubic feet of capacity, may be used for dry or liquid cargoes if not in use for vessel voyage requirements. No. 3 deep tank is rigged for either fuel oil or bulk cargo liquids. A 5,000-barrel (703 LTON) payload can be shipped in this tank if the contemplated voyage is to be short enough that No. 3 tank will not be needed for fuel oil.

³ Standard C3 has no refrigerated cargo capacity; figure given is for C3 passenger and cargo type.

⁴ Standard C4 has no refrigerated cargo capacity; figures given are for C4-S-A4 type.

⁵ Modified Liberty.

⁶ Supertankers are those tankers of over 25,000 DWT, which run up to 100,000 DWT or higher.

d. Detailed Capacities Below Deck.

(1)

	1	2	3	4	5	6
1	Ship type	Hatch No.	Hatch dimensions	Cargo capacities in measurement tons		
				Hold	Tween deck ¹	Deep tanks
2	Liberty.....	{ 1 2 3 4 5	34'4" X 20'0".....	902.0	983.0	415
			35'0" X 20'0".....	2,300.0	1,065.7	0
			20'0" X 20'0".....	1,494.7	597.5	0
			35'0" X 20'0".....	1,315.0	742.0	0
			35'0" X 20'0".....	1,289.0	771.5	0
	Total.....			7,300.7	4,159.7	415
3	FS Freighter.....	{ 1 2	16'0" X 20'0".....	251.0	0	0
			16'0" X 28'0".....	285.0	0	0
	Total.....			536.0	0	0

¹ Known as the "focale."

(2)

	1	2	3	4	5	6	7
1	Ship type	Hatch No.	Hatch dimensions	Cargo capacities in measurement tons			
				Hold	Upper tween deck ¹	Lower tween deck ¹	Deep tanks
2	Victory.....	{ 1 2 3 4 5	22' 4" x 25' 0".....	698	468	594	0
			22' 4" x 24' 0".....	699	675	545	0
			22' 4" x 36' 0".....	1,321	1,111	942	0
			22' 4" x 36' 0".....	1,278	1,230	0	0
			22' 4" x 24' 0".....	647	1,091	0	0
	Total.....			4,643	4,575	2,081	0
3	C1-B.....	{ 1 2 3 4 5	25' 3" x 20' 6".....	862	481	398	0
			31' 6" x 20' 0".....	1,437	750	741	0
			31' 6" x 20' 0".....	1,222	845	779	0
			31' 6" x 20' 0".....	1,205	780	0	480
			31' 6" x 20' 0".....	608	574	0	0
	Total.....			5,334	3,430	1,918	480
4	C1-M-AV1.....	{ 1 2 3 4	19' 11" x 20' 2".....	615	0	601	0
			19' 11" x 40' 5".....	1,378	0	982	0
			19' 11" x 40' 5".....	1,179	0	906	0
			8' 0" x 8' 0".....	113	0	168	0
	Total.....			3,285	0	2,657	0

See footnotes at end of table.

	1	2	3	4	5	6	7
1	Ship type	Hatch No.	Hatch dimensions	Cargo capacities in measurement tons			
				Hold	Upper tween deck ¹	Lower tween deck ¹	Deep tanks
5	Mariner	1	24' 3" x 18' 6" -----	305	402	453	0
			2 30' 0" x 24' 0" -----	637	731	865	0
			3 40' 0" x 30' 0" -----	1,284	1,050	1,454	0
			4 40' 0" x 30' 0" -----	1,528	1,006	1,500	0
			5 40' 0" x 30' 0" -----	401	1,044	410	953
			6 40' 0" x 30' 0" -----	1,646	965	0	298
			7 25' 0" x 30' 0" -----	856	627	0	0
	Total			6,657	5,825	4,682	1,251

¹ Known as the "foeale."

e. Composition of Deadweight Tonnage. Five types comprise the majority of all shipping available for military use. Further detailed data for these vessels follow. It is to be noted that ships' capacities are expressed in long tons in order to agree with normal shipping procedures; whereas, the discharge and loading capabilities of terminal service companies are expressed in short tons in order to agree with practices of other means of transportation.

	1	2	3	4
1	Vessel	Maximum ship-operating supplies* (LTON)	Cargo capacity tonnage when operating supplies (LTON) are maximum *	Total (LTON)
2	Liberty ----	2,800	8,000	10,800
3	Victory ----	3,100	7,500	10,600
4	C1-B ----	1,850	7,250	9,100
5	C1-M-AV1 ----	1,047	6,393	7,440
6	Mariner ----	4,065	9,353	13,418

* Operating supplies include fuel, water, dunnage, and ship stores. Additional payload capacity may be substituted to a limit dependent on length of voyage and character of cargo, which will warrant a reduction in such ship-operating supplies.

f. Vehicle Loading Capacities.

	1	2	3	4	5	6	7	8	9	10	11
1	Vessel	Trucks, utility, ¼-ton, 4 x 4 ¹		Trailers, cargo, 1½-ton, 2-wheel ¹		Trucks, cargo, ¾-ton, 4 x 4 ¹		Trucks, cargo, 2½-ton, 6 x 6, LWB		Trucks, cargo, 5-ton, 6 x 6, LWB	
		On wheels	Crated ²	On wheels	Crated ²	On wheels	Crated ²	On wheels	Crated ²	On wheels	Crated ^{2,3}
2	Liberty	498	2,078	404	4,493	312	744	185	357	102	
3	Victory	512	1,983	512	4,287	331	710	193	340	114	
4	C1-B	511	1,912	491	4,133	337	684	182	328	145	
5	C1-M-AV1	314	645	261	456	167	280	111	114	61	
6	Mariner	1,181	1,740	891	1,732	665	966	364	328	229	

¹ Double the number of ¼-ton trucks on wheels can be stowed if they are stacked. It also is estimated that at least 85 percent more 1½-ton trailers can be loaded if stowed in tandem with drawbar nested inside body of preceding trailer, providing tailgates are drop-type. Regarding the other three types of vehicles, more can be stowed in the Liberty ship by double-decking; see note to C1-B table in *g* below.

² All crated vehicles are boxed by single units except the 1½-ton trailers, which are boxed by twin units.

³ The 5-ton truck, M54, is not shipped crated.

⁴ One hundred fifty-three ¼-ton trucks may be loaded in the bodies of 158 of these trucks. The other 32 trucks will not take jeeps because of the limiting height of the compartments in which stowed. As an alternative, a total of 215 trucks can be stowed by double-decking in Nos. 2 and 3 holds.

*g. Detailed Vehicle, Loading Capacities (stowed on wheels).¹**(1) Liberty ship.*

1	2	3	4	5	6	7
Hatch No.	Location	Trucks, utility ¼-ton, 4 x 4	Trailers, cargo 1½-ton, 2 wheel	Trucks, cargo ¾-ton, 4 x 4	Trucks, cargo 2½-ton, 6 x 6 LWB	Trucks, cargo 5-ton, 6 x 6 LWB
1	'Tween deck.....	28	27	23	12	8
	Lower hold.....	28	24	18	10	5
	On deck.....	41	36	20	13	8
2	'Tween deck.....	54	44	30	21	12
	Lower hold.....	48	42	*30	*18	12
	On deck.....	22	14	10	6	4
3	'Tween deck.....	36	28	25	14	6
	Lower hold.....	32	28	*22	*12	6
	On deck.....	31	20	16	11	8
4	'Tween deck.....	41	37	27	16	8
	Lower hold.....	20	15	18	10	2
	On deck.....	31	22	14	11	6
5	'Tween deck.....	44	34	25	16	9
	Lower hold.....	20	11	20	6	2
	On deck.....	14	12	6	5	4

* Based on no centerline bulkhead, which may not be standard equipment.

¹ There are no available aircraft data for Liberty, Victory, and C1-B ships since their holds are not adaptable to plane stowage consequently, they are seldom used for this purpose.

(2) Victory ship.

1	2	3	4	5	6	7
Hatch No.	Location	Trucks, utility ¼-ton, 4 x 4	Trailers, cargo 1½-ton, 2 wheel	Trucks, cargo ¾-ton, 4 x 4	Trucks, cargo 2½-ton, 6 x 6 LWB	Trucks, cargo 5-ton, 6 x 6 LWB
1	Upper 'tween deck.....	15	16	9	5	0
	Lower 'tween deck.....	16	18	9	6	3
	Hold.....	15	13	8	4	3
	On deck.....	18	16	12	7	4
2	Upper 'tween deck.....	29	26	17	10	4
	Lower 'tween deck.....	25	24	17	10	5
	Hold.....	21	21	14	8	3
	On deck.....	25	29	18	13	8
3	Upper 'tween deck.....	48	48	29	17	12
	Lower 'tween deck.....	46	46	30	18	12
	Hold.....	44	46	30	18	8
	On deck.....	23	25	18	13	8
4	'Tween deck.....	49	48	34	16	14
	Hold.....	49	49	31	18	13
	On deck.....	25	25	17	6	4
5	'Tween deck.....	30	31	20	12	6
	Hold.....	20	19	12	7	3
	On deck.....	20	14	13	7	4

(3) C1-B.*

1	2	3	4	5	6	7
Hatch No.	Location	Trucks, utility ¾-ton, 4 x 4	Trailers, cargo 1½-ton, 2 wheel	Trucks, cargo ¾-ton, 4 x 4	Trucks, cargo 2½-ton, 6 x 6 LWB	Trucks, cargo 5-ton, 6 x 6 LWB
1	On deck.....	14	14	12	5	7
	Upper 'tween deck.....	21	18	12	6	4
	Lower 'tween deck.....	21	18	12	6	5
	Lower hold.....	14	13	9	4	4
2	On deck.....	25	21	18	12	7
	Upper 'tween deck.....	46	37	25	13	12
	Lower 'tween deck.....	42	37	25	15	12
	Lower hold.....	34	36	21	13	11
3	On deck.....	23	21	14	10	5
	Upper 'tween deck.....	44	42	30	17	12
	Lower 'tween deck.....	41	42	28	13	12
	Lower hold.....	41	42	28	13	9
4	On deck.....	21	21	14	10	7
	Upper 'tween deck.....	39	41	26	14	12
	Lower 'tween deck.....	36	37	24	12	10
	On deck.....	16	18	12	7	5
5	'Tween deck.....	23	23	15	7	5
	Hold.....	10	10	12	6	6
	On deck.....	22	22	14	9	6

* Number of vehicles (except 5-ton, 6 x 6) in lower holds of Nos. 2 and 3 hatches can be doubled by flooring over one layer of vehicles a second layer directly on top. The depth of only these two holds will permit such double-decking.

(4) C1-M-AV1.

1	2	3	4	5	6	7
Hatch No.	Location	Trucks, utility ¾-ton, 4 x 4	Trailers, cargo 1½-ton, 2 wheel	Trucks, cargo ¾-ton, 4 x 4	Trucks, cargo 2½-ton, 6 x 6 LWB	Trucks, cargo 5-ton, 6 x 6 LWB
1	'Tween deck.....	30	23	16	10	3
	Hold.....	16	13	7	4	2
	On deck.....	30	24	18	10	8
2	'Tween deck.....	51	46	28	19	10
	Hold.....	51	45	28	19	10
	On deck.....	28	22	14	10	6
3	'Tween deck.....	44	37	27	17	9
	Hold.....	44	37	26	15	9
	On deck.....	20	20	11	7	4

(5) Mariner.

1	2	3	4	5	6	7
Hatch No.	Location	Trucks, utility ¾-ton, 4 x 4	Trailers, cargo 1½-ton, 2 wheel	Trucks, cargo ¾-ton, 4 x 4	Trucks, cargo 2½-ton, 6 x 6 LWB	Trucks, cargo 5-ton, 6 x 6 LWB
1	Upper 'tween deck.....	20	16	12	6	4
	Lower 'tween deck.....	14	10	9	4	0
	Hold.....	9	5	6	3	0
	On deck.....	33	23	20	10	7

See footnotes at end of table.

1	2	3	4	5	6	7
Hatch No.	Location	Trucks, utility ¼-ton, 4 x 4	Trailers, cargo 1½-ton, 2 wheel	Trucks, cargo ¾-ton, 4 x 4	Trucks, cargo 2½-ton, 6 x 6 LWB	Trucks, cargo 5-ton, 6 x 6 LWB
2	Upper 'tween deck	37	23	22	11	7
	Lower 'tween deck	26	21	15	9	7
	Hold	15	11	9	5	2
	On deck	52	42	30	20	10
3	Upper 'tween deck	61	48	38	25	13
	Lower 'tween deck	52	44	32	21	13
	Hold	36	32	22	14	9
	On deck	52	36	26	18	10
4	Upper 'tween deck	69	46	38	20	14
	Lower 'tween deck	69	46	38	20	14
	Hold	56	44	30	16	12
	On deck	54	36	28	20	12
5	Upper 'tween deck	72	56	42	18	14
	Lower 'tween deck	74	58	44	* 18	* 14
	Hold	72	56	42	* 16	* 12
	Deep tank	36	28	14	6	2
	On deck	54	40	30	20	12
6	'Tween deck	65	47	36	18	14
	Hold	34	30	20	12	9
	Deep tank	10	4	0	0	0
	On deck	37	27	22	12	7
7	'Tween deck	42	33	23	11	7
	Hold	10	9	6	4	0

* On nonrefrigerated type only. Approximately three 5-tons or four 2½-tons can be loaded in these decks on refrigerated-type vessels.

Note. The figures contained in the preceding charts reflect general loading conditions and by no means represent the maximum vehicle capacities of the type vessels. With the exception of crated vehicles, no allowance has been made for stacking or double-decking. All below-deck stowage is fore and aft, except in the case of ¼-ton trucks and 1½-ton trailers, which are stowed both fore and aft and athwartship.

7-53. Approximate Sailing Distances in Nautical Miles

Ports	Ports of embarkation						
	Boston	New York	Charleston	New Orleans	Los Angeles	San Francisco	Seattle
United States							
Boston		200	900	2,000	1 5,100	1 5,400	1 6,200
New York	200		600	1,700	1 4,900	1 5,300	1 6,000
Charleston	900	600		1,200	1 4,500	1 4,900	1 5,600
New Orleans	2,000	1,700	1,200		1 4,300	1 4,700	1 5,500
Los Angeles	1 5,100	1 4,900	1 4,500	1 4,300		400	1,100
San Francisco	1 5,400	1 5,300	1 4,900	1 4,700	400		800
Seattle	1 6,200	1 6,000	1 5,600	1 5,500	1,100	800	
North Atlantic							
Newfoundland, St. John's	900	1,100	1,700	2,600	1 5,700	1 6,000	1 6,800
Greenland, Ivigtut	1,700	1,900	2,400	3,400	1 6,500	1 6,800	1 7,600
Iceland, Reykjavik	2,300	2,500	3,000	4,000	1 7,100	1 7,400	1 8,200
Europe							
United Kingdom:							
Liverpool	3,000	3,200	3,700	4,700	1 7,600	1 7,900	1 8,700
Southampton	3,000	3,200	3,600	4,600	1 7,500	1 7,800	1 8,600
Northern Ireland, Belfast	2,900	3,000	3,400	4,400	1 7,200	1 7,500	1 8,300
Norway, Oslo	3,900	4,100	4,400	5,300	1 8,200	1 8,600	1 9,400

See footnote at end of table.

Ports	Ports of embarkation						
	Boston	New York	Charleston	New Orleans	Los Angeles	San Francisco	Seattle
Russia:							
Archangel.....	4,000	4,200	4,800	5,800	¹ 8,800	¹ 9,200	¹ 10,000
Murmansk.....	3,700	3,800	4,400	5,400	¹ 8,500	¹ 8,900	¹ 9,700
France:							
Le Havre.....	3,000	3,200	3,600	4,600	¹ 7,500	¹ 7,800	¹ 8,600
Brest.....	2,900	3,100	3,500	4,500	¹ 7,400	¹ 7,700	¹ 8,500
Bordeaux.....	3,000	3,200	3,700	4,700	¹ 7,600	¹ 7,900	¹ 8,700
Belgium, Antwerp.....	3,200	3,400	3,800	4,800	¹ 7,700	¹ 8,000	¹ 8,800
Mediterranean							
France, Marseille.....	² 3,700	² 3,900	² 4,300	² 5,300	¹ 8,000	¹ 8,200	¹ 9,000
Italy, Naples.....	² 4,000	² 4,200	² 4,600	² 5,600	¹ 8,300	¹ 8,500	¹ 9,300
Algeria, Algiers.....	² 3,400	² 3,600	² 4,000	² 5,000	¹ 7,700	¹ 8,000	¹ 8,800
Strait of Gibraltar.....	3,000	3,200	3,600	4,600	¹ 7,300	¹ 7,500	¹ 8,300
Caribbean and South Atlantic							
Bermuda, Hamilton.....	700	700	800	1,700	¹ 4,600	¹ 4,900	¹ 5,800
Puerto Rico, San Juan.....	1,500	1,400	1,100	1,500	¹ 8,900	¹ 4,300	¹ 5,100
Trinidad, Port of Spain.....	2,000	1,900	1,700	2,100	¹ 4,100	¹ 4,400	¹ 5,300
Brazil, Rio de Janeiro.....	4,700	4,800	4,700	5,200	¹ 7,200	¹ 7,600	¹ 8,400
Argentina, Buenos Aires.....	5,800	5,900	5,800	6,300	¹ 8,300	¹ 8,700	¹ 9,600
Panama Canal, Panama.....	2,200	2,000	1,600	1,400	2,900	¹ 3,200	4,000
Middle East							
Egypt, Port Said.....	² 4,900	² 5,100	² 5,500	² 6,500	¹ 9,200	¹ 9,500	¹ 10,300
Arabia, Aden.....	² 6,300	¹ 6,500	² 6,900	² 7,900	¹ 10,600	¹ 10,900	¹ 11,700
Turkey, Istanbul.....	² 4,800	² 5,000	² 5,400	² 6,400	¹ 9,100	¹ 9,400	¹ 10,200
Iran, Khorramshahr (Persian Gulf).....	² 8,300	² 8,500	² 8,900	² 9,800	¹ 12,600	¹ 12,900	¹ 13,700
North Pacific							
Alaska, Dutch Harbor.....	¹ 7,400	¹ 7,300	¹ 6,900	¹ 6,700	2,400	2,100	1,700
Middle Pacific							
Hawaiian Islands, Honolulu.....	¹ 6,900	¹ 6,700	¹ 6,300	¹ 6,100	2,200	2,100	2,400
Marshall Islands, Kwajalein.....	¹ 9,200	¹ 9,000	¹ 8,600	¹ 8,400	4,200	4,410	4,500
Mariana Islands, Guam.....	¹ 10,200	¹ 10,000	¹ 9,600	¹ 9,400	5,600	5,100	4,900
Japan, Yokohama.....	¹ 9,900	¹ 9,600	¹ 9,500	¹ 9,100	4,800	4,500	4,200
Southwest Pacific							
New Guinea, Finschhafen.....	¹ 10,200	¹ 10,000	¹ 9,600	¹ 9,400	6,100	5,900	6,000
Philippine Islands, Manila.....	¹ 11,600	¹ 11,300	¹ 11,000	¹ 10,800	6,600	6,300	6,100
Australia:							
Brisbane.....	¹ 9,900	¹ 9,600	¹ 9,300	¹ 9,100	6,300	6,200	6,500
Melbourne.....	¹ 10,100	¹ 9,900	¹ 9,500	¹ 9,400	7,000	7,000	7,300
Malaya, Singapore.....	² 9,900	¹ 10,100	² 10,500	² 11,500	7,900	7,500	7,100
China-India-Burma							
China:							
Shanghai.....	¹ 10,800	¹ 10,600	¹ 10,200	¹ 10,000	5,700	5,400	5,100
Hong Kong.....	¹ 11,400	¹ 11,200	¹ 10,800	¹ 10,600	6,400	6,000	5,700
India:							
Bombay.....	² 8,000	² 8,200	² 8,600	² 9,500	^{1 2} 12,200	^{1 2} 12,600	^{1 2} 13,400
					10,300	9,600	9,500
Calcutta.....	² 9,600	² 9,800	² 10,200	² 11,200	^{1 2} 13,900	^{1 2} 14,200	^{1 2} 15,000
					9,500	9,100	8,700
Burma, Rangoon.....	² 9,600	² 9,800	² 10,200	² 11,200	^{1 2} 13,900	^{1 2} 14,200	^{1 2} 15,000
					9,000	8,600	8,200
East Russia, Vladivostok.....	¹ 9,500	¹ 9,300	¹ 8,900	¹ 8,700	5,000	4,600	4,400

¹ Via Panama Canal.² Via Strait of Gibraltar.

7-54. Shipping Turnaround Times

a. General. Turnaround time for similar-type ships seldom will be the same between two ports, or other equidistant runs, unless sailings are carefully controlled. Assuming controlled operating conditions, a basis for turnaround times can be established for type ships (troop or cargo) for general planning purposes.

b. Turnaround Time Components. Turnaround time components are—

- (1) Loading time at home port.
- (2) Steaming time to and from destination.
- (3) Unloading and loading time at destination.
- (4) Unloading time at home port.
- (5) Normal voyage repair and reoutfitting time.

c. Planning factors.

- (1) Sailing distances per day.*

d. Table Convoy Sailing Times (Days).

(a) *Cargo ships.*

1. Slow—240 nautical miles.
2. Fast—360 nautical miles.

(b) *Passenger ships.*

1. Slow—360 nautical miles.
2. Fast—432 nautical miles.

* For convoy sailing speed of advance, deduct 10 percent for delays in forming convoys, zigzagging en route, etc. The 10 percent loss factor is not applicable to ships in the "fast" category since such ships will normally proceed individually.

(2) *Time in ports per round trip for unloading, loading, voyage repairs, and reoutfitting.*

- (a) Cargo ships—35 days.
- (b) Troop ships—20 days.
- (c) Tankers—10 days.

(3) *Convoys and effect on turnaround time.* A major portion of shipping may be conducted in convoy formation, the speed of which is dictated by the slowest vessel in each convoy. This factor must be considered when computing turnaround time for convoy or escorted shipping.

Ports	Ports of embarkation *														
	Boston		New York		Charleston		New Orleans		Los Angeles		San Francisco		Seattle		
	Type of shipping														
	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	
United States															
Boston.....									48	72	50	74	54	82	
New York.....									46	70	49	74	53	80	
Charleston.....									45	67	47	71	51	77	
New Orleans.....									44	67	46	69	51	77	
Los Angeles.....	48	72	46	70	45	67	44	67							
San Francisco.....	50	74	49	74	47	71	46	69							
Seattle.....	54	82	53	80	51	77	51	77							
North Atlantic															
Newfoundland, St. John's.....			27	40	30	45	36	53	55	82	57	85	61	92	
Greenland, Ivigtut.....	30	45	31	47	35	52	41	61	60	89	62	92	66	100	
Iceland, Reykjavik.....	34	50	35	52	38	57	44	67	63	95	65	97	70	106	
Europe															
United Kingdom:															
Liverpool.....	38	57	39	59	43	64	49	73	66	100	68	102	73	110	
Southampton.....	38	57	39	59	42	63	48	72	66	99	68	102	72	109	
Northern Ireland, Belfast.....	38	56	38	57	41	61	47	70	64	96	66	99	71	106	
Norway, Oslo.....	44	66	45	68	47	70	52	78	70	105	72	109	77	116	
Russia:															
Archangel.....	44	67	46	69	49	74	55	83	73	111	76	114	81	122	
Murmansk.....	43	64	43	65	47	70	53	80	72	108	74	112	79	119	

See footnote at end of table.

Ports	Ports of embarkation *													
	Boston		New York		Charleston		New Orleans		Los Angeles		San Francisco		Seattle	
	Type of shipping													
	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo
France:														
Le Havre.....	38	57	39	59	42	63	48	72	66	99	68	102	72	109
Brest.....	38	56	39	58	41	62	48	71	65	97	67	101	72	108
Bordeaux.....	38	57	39	59	43	64	49	73	66	100	68	102	73	110
Belgium, Antwerp.....	39	59	41	61	43	65	49	74	67	101	69	103	73	111
Mediterranean														
France, Marseille.....	43	64	44	66	46	69	52	78	69	103	70	106	75	113
Italy, Naples.....	44	67	46	69	48	72	54	81	71	106	72	108	77	115
Algeria, Algiers.....	41	61	42	63	44	67	50	76	67	101	69	103	73	111
Strait of Gibraltar.....	38	57	39	59	42	63	48	72	65	97	66	99	71	106
Caribbean and South Atlantic														
Bermuda, Hamilton.....							30	45	48	72	50	75	55	83
Puerto Rico, San Juan.....	29	44	28	42	27	40	29	44	44	66	46	69	50	76
Trinidad, Port of Spain.....	32	48	31	47	30	45	33	49	45	68	47	70	52	78
Brazil, Rio de Janeiro.....	49	73	49	74	49	73	51	78	64	96	66	100	71	107
Argentina, Buenos Aires.....	55	83	56	84	55	83	59	88	71	106	73	110	78	118
Panama, Panama Canal.....	33	48	32	48	30	45	28	42	38	56	39	59	44	67
Middle East														
Egypt, Port Said.....	50	75	50	76	54	80	60	89	76	114	78	117	83	124
Arabia, Aden.....	51	78	60	89	62	93	68	102	85	127	86	130	92	137
Turkey, Istanbul.....	49	74	50	76	53	80	59	89	76	113	77	116	82	124
Iraq, Basra.....	71	106	72	108	73	110	80	120	97	145	99	147	104	155
North Pacific														
Alaska, Dutch Harbor.....	65	97	65	97	62	93	61	91	35	52	33	49	30	45
Middle Pacific														
Hawaiian Islands, Honolulu.....	62	93	61	91	59	88	57	86	33	48	33	49	35	52
Marshall Islands, Kwajalein.....	76	114	75	113	72	109	71	107	46	69	47	70	48	71
Marianas, Guam.....	82	124	81	122	78	118	77	116	54	81	50	76	50	75
Japan, Yokohama.....	80	121	79	118	78	117	76	113	49	74	48	71	46	69
Southwest Pacific														
New Guinea, Finschhafen.....	82	124	81	122	78	118	77	116	57	86	56	84	57	85
Philippines, Manila.....	91	136	89	133	87	131	86	129	60	90	59	88	57	86
Australia:														
Brisbane.....	80	121	78	118	77	115	76	113	59	88	58	87	60	89
Melbourne.....	82	123	80	121	78	117	77	116	62	94	62	94	65	97
Malaya, Singapore.....	80	121	82	123	83	126	90	134	68	102	66	99	63	95
China-India-Burma														
China:														
Shanghai.....	86	129	85	127	82	124	81	122	55	82	53	80	50	76
Hong Kong.....	90	135	88	132	86	129	85	127	59	89	57	85	55	82
India:														
Bombay.....	69	103	70	106	72	109	78	117	94	142	97	145	102	153
									83	124	80	121	78	117
Calcutta.....	79	118	80	120	82	124	88	132	105	157	108	160	112	167
									78	117	76	113	73	110
Burma, Rangoon.....	79	118	80	120	82	124	88	132	165	157	108	160	112	167
									75	113	72	109	70	106
East Russia, Vladivostok.....	78	117	77	115	74	112	73	110	50	76	48	72	47	70

* All turnaround times are based on the routes indicated in the table in paragraph 7-53 and on data given in c above. The turnaround times between ports, with the exception of inter-U. S. port times, include a 10 per cent safety factor for forming convoy, zigzagging, etc.

Section X. MISCELLANEOUS TRANSPORT

7-55. General

There are other means of transportation which are relatively less important than pipeline, water, rail, highway, and air transportation in the overall picture of transportation, but all have peculiar characteristics which are adaptable to special situations, as indicated in paragraphs 7-56. through 7-58. For this reason, planners should not underestimate their value.

7-56. Pack Animals

a. *Employment.* Pack mules may be employed to transport light cargo over terrain which is impassable for motor transport.

b. *Characteristics and Capabilities.*

- (1) *Height*—59 to 62 inches.
- (2) *Weight*—1,000 to 1,200 pounds.
- (3) *Rate of march*—4 to 5 miles in the hour.
- (4) *Cargo load*—200 to 250 pounds.
- (5) *Movement of casualties*—one litter or two sitting casualties.
- (6) *Forage*—10 pounds of oats and 14 pounds of hay per day. May be reduced for short periods up to 10 days without impairing capacity.
- (7) *Water*—10 gallons per day.
- (8) *Average daily distance.*
 - (a) Mountainous terrain—12 miles.
 - (b) Rolling or flat terrain—20 miles.
- (9) *Gradability.*
 - (a) Rate of ascent—1,650 vertical feet per hour.
 - (b) Rate of descent—1,000 vertical feet per hour.
- (10) *Noneffective rate*—32 per 1,000 mules.

c. *Transportability.*

	1	2
1	Vehicle	Capacity (horses or mules)
2	Truck, ¾-ton, cargo, 4 x 4 ---	2
3	Truck, 2½-ton, cargo, 6 x 6 ---	4
4	Semitrailer, 6-ton, combination animal and cargo.	8
5	Railroad stock car, 40-foot ----	25 (approx.)
6	Railroad stock car, 36-foot ----	20 to 22 (approx.)
7	Airplane, transport * -----	4 to 6

* May be transported at altitudes up to 18,000 feet with no ill effects.

d. *Horse-drawn Carts.* Capable of traveling 20 miles in the day and sustaining a payload of 1,000 pounds.

7-57. Sled Trains

a. *General.* The mission of a sled train is to furnish oversnow and overice movement of supplies, equipment, and personnel. Sled trains will be employed when more efficient means of transportation are not feasible.

b. *Planning Factors.*

(1) *Capacity of cargo transporters.*

- (a) Sled, 10-ton (OTACO); bed dimensions, 8' x 20'; capacity, 20,000 lb.
- (b) Sled, 20-ton (OTAGO); bed dimensions, 12' x 24'; capacity, 40,000 lb.
- (c) Transporter, cargo, large wheel, off road (Thompson trailer); main cargo bed dimensions (with side extensions), 12' x 13'; rear axle cargo well, 2 usable cargo areas, each 4' x 4' separated by rear axle; capacity, 20,000 lb.

(2) *Capability of tractor prime movers.*

Recommended loads for a heavy crawler tractor are listed in the table below. Experience has shown that loads greater than these result in greatly increased equipment failure and frequent inability of the tractor to move the load under soft snow conditions.

	1	2	3
1	Class	Net weight (lb)	Load (tons)
2	Tractor, full-tracked, diesel-engine driven, heavy drawbar pull, low ground pressure (LGP) Caterpillar D8 w/D-342 engine.	72,000	40
3	Same, but w/D-353 engine ---	72,000	50

Note. Not used when traveling over unprepared trails or cross country.

(3) *Payload capacity.* Assuming that marked trails are used, weather delays will be encountered, and malfunctioning equipment will be dropped for later recovery, the payload capacity of 5 tractor sled trains (D8 LGP W/D

—342 engine as prime mover) consisting of 1 command train (1 tractor pulling 4 wanigans) and 4 cargo trains (4 tractors each pulling 4 loaded 10-ton sleds or 10-ton trailers

or 2 loaded 20-ton sleds) on 161- and 322-kilometer (100- and 200-mile) destination trips is determined as follows:

	1	2	3
1		322 kilometers round trip	644 kilometers round trip
2	Fuel per tractor—2.22 gallons per kilometer x kilometers (round trip) -----	715 gal	1,430 gal
3	Gal per tractor x 5 tractors -----	3,575 gal	7,150 gal
4	Plus 15 percent safety margin -----	536 gal	1,072 gal
5	Total gal -----	4,111 gal	8,222 gal
6	Total gal x 7.75 lb per gal (bulk diesel at 10°F.) -----	31,860 lb	63,720 lb
7	Lubricants, alcohol, and antifreeze—30 lb per tractor per 161 kilometers -----	300 lb	600 lb
8	Travel time at 80.5 kilometers per day -----	4 days	8 days
9	Fuel for snow melters, heaters and electric generators in command train—180 gal per day x 7.75 lb per gal -----	5,580 lb	11,160 lb
10	Total domestic load (6 + 7 + 9) -----	37,740 lb, or 18.87 short tons	75,480 lb, or 37.74 short tons
11	Gross capacity: 4 cargo trains x 40 short tons per train -----	160 short tons	160 short tons
12	Payload capacity (11-10) -----	141.13 short tons	122.26 short tons

Note. Rations, tools, repair parts, and survival equipment are all carried in or on the wanigans of the command train. This permits the sleds or trailers of the cargo trains to be fully utilized as cargo carriers.

- (4) *Rates of speed.* The following performance figures pertain to the D8 (Caterpillar) LGP tractors used in Greenland by the United States Army Polar Research and Development Center and in Antarctica by the United States Navy Antarctic Support Force. The tractors are equipped with either the D-342 turbocharged engine or the D-353 turbocharged engine.

Gear	D-342		D-353	
	Speed (mph) (kmph)		Speed (mph) (kmph)	
	Forward	Reverse	Forward	Reverse
1st	1.5/2.41	2.0/3.21	2.02/ 3.25	2.02/ 3.25
2d	1.9/3.05	2.6/4.18	2.87/ 4.61	2.87/ 4.61
3d	2.8/4.50	3.8/6.11	3.50/ 5.63	7.44/11.97
4th	3.8/6.11	-----	5.38/ 8.65	-----
5th	5.2/8.36	-----	7.44/11.97	-----

Note. Average speed (over snow) is the 3d gear speed.

c. *Transportation Cargo Carrier Company (Tracked) (TOE 55-27C)* See FM 101-10-2.

7-58. Human Bearers

a. *General.* Human bearers consist of indigenous or other personnel used for the transportation of personnel and/or supplies. Their use is generally limited to those situations where other means are impracticable or not available.

b. *Planning Data.* For planning purposes, the following factors may be assumed:

- (1) *Cargo loads.*
 - (a) Male bearer—80 pounds average load.
 - (b) Female bearer—30 to 35 pounds average load.
- (2) *Personnel loads*—8 to 12 bearers per litter team (for continuous operation).
- (3) *Rate of march*—12 miles in the day under average conditions.
- (4) Overloading and speedup of operations cause desertions and increase the sick rate.
- (5) *Noneffective rate*—approximately 30 percent.
- (6) Close supervision required to prevent pilferage.

CHAPTER 8

LOGISTICS—SERVICE

Section I. GENERAL

8-1. Coverage

This section contains information of and measurement factors involved in the services of construction and maintenance.

8-2. Cross Reference

a. Troop requirements for all services are found in paragraphs 4-1 through 4-7 and in FM 101-10-2.

b. Tactical signal communication is covered in paragraphs 4-19, through 4-26.

c. Field engineering is covered in paragraphs 4-27 through 4-34.

d. Characteristics of selected materiel are covered in chapter 5.

8-3. Base Development

a. *General.* For general aspects of base development planning, including responsibilities for, planning considerations, the planning directive, elements of base development plans, and a sample format for a base development plan, see FM 100-10.

b. *Phases of Base Development.*

- (1) *Assault and consolidation.* This is the period for the assault and consolidation by the combat forces in the objective area. Some elements of the base command are attached to tactical units and arrive early in the operation to assist in initiating base development.
- (2) *Exploitation.* This period covers the time between the establishment of the combat forces in the objective area and the time that tactical operations have progressed to such a degree that

the base area is relatively secure from ground attack.

- (3) *Development.* This is the principal period for base development. It extends from the time the base area is relatively secure from ground attack until the cessation of tactical operations or until rollup begins.

c. *Logistical Requirements for Base Development.* Logistical requirements for the three phases of base development vary widely. During the assault and consolidation phase, logistical requirements are characteristic of those peculiar to amphibious or airborne operations. (See FM 31-12 and FM 57-100.) During the exploitation phase, requirements become progressively more stable, centralized, and predictable. In the development phase, installations are completed, streamlined, and balanced to produce an efficient flexible operating base. (For detailed estimates of materials and efforts required, see TM 5-301, TM 5-302, and TM 5-303.)

d. *Logistical Data for Base Development.* Data applicable to initial base development planning in its various phases are found throughout this manual. Data pertaining to major base development tasks are found in the following locations:

- (1) Storage—paragraphs 5-64 through 5-74.
- (2) Hospital bed requirements — paragraphs 6-6 through 6-9.
- (3) Transportation — paragraphs 7-1 through 7-58.
- (4) Construction — paragraphs 8-4 through 8-13.
- (5) Communications — paragraphs 4-19 through 4-26.

Section II. CONSTRUCTION

8-4. Engineer Construction Troops

a. Battalion Month. One battalion month is the construction effort of an average experienced and properly equipped engineer construction battalion during 1 month of time. For general estimates, the battalion month represents 140,000 man-hours of construction effort. (See para 8-12a(2) and b.)

b. Force Estimates. The force estimates outlined herein should be used only as a general planning guide and must be modified for known or expected conditions of particular operations.

c. Unit Equivalents. It is not practicable to state an average factor for construction effort of the various other engineer units, based on the battalion-month yardstick, as defined in *a* above, which will be applicable to all types of construction projects. The quantity and type of equipment assigned to the unit and its training are important factors in determining its effectiveness on a particular type of construction work. *For example*, an engineer combat battalion would be more effective than an engineer construction battalion in the repair of roads in a combat zone (average factor 1.3), but an engineer combat battalion would be much less effective than an engineer construction battalion in the construction of a new road in the communications zone, requiring considerable earthmoving (average factor 0.6). The factors listed in the table below are based on the assumption that, in general, the average construction project in a combat zone requires much less heavy engineer equipment than the average construction project in a communications zone. The factors apply only to properly equipped engineer units of average experience. They should be used only in broad planning and do not apply to any one particular construction project. The many factors involved make it advisable that an experienced engineer officer, *familiar with the technical details of a particular project*, determine the type of engineer unit to be assigned to its construction whenever practicable.

	1	2	3
1	Unit	Average construction effort factor	
		Combat zone	Communications zone
2	Engr const bn -----	1.0	1.0
3	Engr cmbt bn -----	1.3	0.6
4	Engr cmbt bn plus LE co --	1.4	0.9
5	Engr const bn plus const spt co.	1.2	1.4

8-5. Roads

a. Road Nets.

- (1) Construction and maintenance of roads in a theater of operations is held to the minimum required by the situation and is based on maximum use of the existing road net. The capacity of roads of various types, in short tons forward per day, is given in paragraph 7-13.
- (2) Normally the minimum two-lane road nets to be provided and maintained are as follows:
 - (a) In the combat zone—
 1. One earth road per division forward of division rear boundary.
 2. Two improved (gravel, crushed rock, etc.) roads per corps forward of field army rear boundary.
 3. Lateral improved roads at 16 km intervals in rear of division rear boundary.
 4. Access roads as required at depots, supply points, and other installations in corps rear and field army service areas.
 - (b) In the communications zone—
 1. Two bituminous surface-treated roads to each field army service area. Connecting roads as required to ports and beaches.
 2. Access roads as required at depots and other installations in the communications zone.

b. *New Construction of Roads.*

- (1) *Construction policy.* New road construction is undertaken only when absolutely necessary, and normally it includes only such items as detours to bypass demolitions and access roads. The factors listed in the tables in (3) through (6) below are given primarily for estimating rehabilitation as a percentage of the requirements for new construction.

- (2) *Bridge and culvert requirements.* For planning purposes, it is assumed that 1 km of new road requires 7.5 meters of bridging and 4.5 culverts.
- (3) *Material requirements for 1 km of new road* (including bridges, culverts, and asphalt for surfacing). This table does not include gravel or crushed rock requirements for road surfacing, which are given in table in (4) below.

1	Type of road	2	3	4	5
		Single-lane 12'/3.7m wide		Double-lane 24'/7.3m wide	
		STON	MTON	STON	MTON
2	Earth, graded and drained	2.5	1.9	3.1	2.9
3	4"/102-mm (2 lane 6"/152-mm) stabilized earth or stone	3.1	2.5	6.2	4.3
4	1"/25-mm cold surface treatment on 4" (2 lane 6") crushed stone	18.6	21.1	33.5	42.2
5	1"/25-mm surface treatment, on existing base	13.6	18.6	27.3	37.8
6	2"/51-mm cold road mix, cold laid asphalt on 6"/152-mm crushed stone	27.3	35.3	52.7	69.4
7	3"/76-mm cold road mix, cold laid asphalt on 6"/152-mm crushed run base	35.9	47.7	70.0	94.2

Note. Bridging as in (5) below, except that bridging for earth roads, is estimated at 75 percent timber and 25 percent steel stringers on wood substructures.

(4) *Gravel or crushed rock requirements for 1 km of new road.*

1	Type of road	2	3	4	5
		Surface 12'/3.7m wide		Surface 24'/7.3m wide	
		Cu yds/ m ³	Short tons	Cu yds/ m ³	Short tons
2	Base 4"/102-mm thick *	485/371	726	970/742	1,452
3	2"/51-mm asphalt surface	243/185	363	485/370	726
4	Base 6"/152-mm thick *	728/557	1,082	1,456/1,114	2,164
5	3"/76-mm asphalt surface	364/278	546	728/556	1,082

* Based on loose thickness. For compacted thickness, add 25 percent.

- (5) *Fixed-bridge requirements per km of road.* (Based on 24.8 feet/7.5 meters of bridging per 1 km of route and on average percentages of the various types of standard military bridging spans.)

	1	2	3	4	5	6	7	8	9
1	Type of span	Percent- age	Feet/ meters	One-lane			Two-lane		
				Short tons	Measure- ment tons	Man- hours	Short tons	Measure- ment tons	Man- hours
2	Timber, 14-20'/4.2-6.1m ¹	20	5/1.5	3.8	4.5	39	6	7	75
3	30'/9.1m span, 6-27", WF beams ²	21	5.2/1.6	(³)	(³)	(³)	7	7.8	147
4	60'/18.2m span, 6-36", WF beams ²	24	6/1.8	(³)	(³)	(³)	6.9	7.9	236
5	80'/24.3m span, 9-36", WF beams ²	12	3/0.9	(³)	(³)	(³)	4.2	5.0	133
6	6-48" steel girders, 90-120'/36.5m span.....	11	2.7/.8	(³)	(³)	(³)	4.8	4.9	70
7	Bailey, through truss, DD, 130'/39.6m.....	12	2.9/.9	4.9	5.5	64	9.3	10.6	122
8	Total.....	100	24.8/7.5	NA	NA	NA	38.2	43.2	783

¹ Timber bridge data are based on typical timber bridging with 15'/4.6m wood stringers. See TM 5-286.

² Semipermanent steel highway bridging is described in TM 5-285 and 5-302.

³ One-lane bridging is not applicable.

Notes. Bridging as in (5) above, except that bridging for earth roads, is estimated at 75 percent timber and 25 percent steel stringers on wood substructures.

(6) *Construction effort.* Net effective man-hours of engineer construction troops required for grading and surfacing 1.6 km of new road to the following standards: 1-lane road (3.7-meters traffic lanes plus 1.2-meters shoulders); double-lane road (7.3-meters traffic lane plus 1.2-meters shoulders).^{1,2}

	1	2	3	4	5	6	7
1	Terrain	One-lane			Double-lane		
		Grading only	Grading and 6-in. gravel	Grading, 6-in. gravel, and 3-in. asphalt	Grading only	Grading and 6-in. gravel	Grading, 6-in. gravel, and 8-in. asphalt
2	Flat prairie.....	2,500	3,300	12,500	3,700	5,200	20,400
3	Rolling.....	3,400	4,200	13,500	4,300	6,000	21,000
4	Hilly, forested.....	4,700	5,600	14,750	6,000	7,600	23,000
5	Mountain, forested, no rock.....	8,400	9,300	18,500	23,000	29,000	45,500
6	Mountain, some rock.....	14,000	19,500	28,500	39,000	49,000	64,500
7	Mountain, heavy rock.....	26,500	32,000	41,500	74,000	84,000	101,000

¹ Based on pit-bank run gravel, except lines 6 and 7, which are based on crushed rock for material.

² The tabulated man-hours do not include effort for bridging and culverts.

c. Road Rehabilitation. Materials and effort required to rehabilitate roads after action, in percentages of the materials and effort required for new construction, are as follows:

	1	2
1	Rehabilitation of—	Equivalent percentages of new construction (percentage)
2	Roads.....	10 to 20
3	Culverts.....	15
4	Bridges.....	50 to 90

d. Road Maintenance. After rehabilitation, and not allowing for further damage in action, suitably trained and equipped engineer troops maintain roads on the basis of 9½ man-hours net effective effort per kilometer of road per day.

e. Policy for Road and Bridge Construction.

(1) *Responsibility.* Between combat and communications zones, bridging is normally on an area basis. Theater army logistical command forces take over bridging operations in rear of the

field army area as rapidly as possible. Rearward elements assume bridge and road maintenance in forward areas as soon as the situation permits. Rearward engineer units are charged with replacing tactical and other portable types of bridging with nonportable types as quickly as possible, strengthening bridging to carry successively heavier loads, and removing such tactical bridging as the situation justifies.

- (2) *General bridge policy.* Tactical bridging is normally placed by corps engineers. Organizational equipage will be replaced as quickly as possible by rearward engineers. Stocks of Bailey, WF beam, girder, I-beam, 27.4-meters pony truss bridging, and timber trestle bridge with steel beams are available in depots for use in the communications zone and also in the combat zone when time and the tactical situation permit. Bailey bridging will be utilized by forward units when practicable. Replaced and surplus bridging is returned to depots.

8-6. Railway Construction

a. New Construction.

- (1) The railroad division used in planning includes 160 route kilometers of main line, single or double track, together with its terminal operating and main-

tenance facilities, fueling and watering facilities as required, and the necessary signaling equipment or interlocking facilities for safe operation. Passing sidings on single-track lines, stations, and crossovers at double-track lines at stations are at intervals as required by the traffic. Normally, at least one spur or siding is provided at each station.

- (2) Materials and man-hours (net effective) required for new construction of a kilometer of standard gage (4 ft 8½ in./1.435m) single-track railroad are as follows.

	1	2	3	4
	Item	Short tons	Measurement tons	Man-hours
2	Grading -----			¹ 2,480
3	Ballast delivered -----			² 1,550
4	Track laying and surfacing -----			1,594
5	Bridging—13.2 meters per kilometer -----	63	68.8	1,365
6	Culverts—4 per kilometer—average 12-m length -----	5	4.3	868
7	Ties—1,798 -----	135	186.0	
8	Rail—90 lb -----	99	27.9	
9	Fastening—(based on 11.9 meters rail) -----	21	6.2	
10	Total -----	323	293.2	7,857

¹ Includes clearing based on average wooded terrain.

² Bank-run material average haul—5 kilometers.

b. *Rehabilitation.* The following table reflects the rehabilitation requirements which can be anticipated for a 160-km/100-mile standard gage single-track division extending inland from a port, using average percentages of demolition over the entire division.

	1	2	3	4	5	6	7
	Items	Quantity per 160 km/100 miles	Demolition percentage	Rehabilitation (quantity)	Material ¹		Man-hours ¹ (thousands)
					Short tons	Measurement tons	
2	Main line -----	160 km/100 mi	13	20.9 km/13 mi	3,820	2,514	68
3	Port trackage ² -----	4.8 km/3 mi	100	4.8 km/3 mi	1,440	1,098	22
4	Passing sidings ² -----	7.2 km/4.5 mi	80	5.8 km/3.6 mi	1,730	1,320	17
5	Station sidings ² -----	4.8 km/3 mi	80	3.9 km/2.4 mi	1,150	880	12
6	Railway terminal ^{2 3} -----	1 ea	75	0.75 ea	7,100	6,800	160

See footnotes at end of table.

	1	2	3	4	5	6	7
1	Items	Quantity per 160 km/100 miles	Demolition percentage	Rehabilitation (quantity)	Material ¹		Man-hours ¹ (thousands)
					Short tons	Measure- ment tons	
7	Water stations.....	3 ea	100	3 ea	135	210	9
8	Fuel station.....	1 ea	100	1 ea	21	18	1
9	Bridging.....	2134m/7,000'	70	1494m/4,900'	8,950	7,770	154
10	Culverts.....	8534m/28,000'	15	1280m/4,200'	120	105	21
11	Grading.....						35
12	Ballast.....						44
13	Total.....				24,466	20,715	543

¹ Tunnels require special consideration. To repair (by timbering), a 50-foot/15 m demolition at each end of a single-track tunnel (100'/80.5m total per tunnel), allow 70 short tons, 87 measurement tons, and 3,000 man-hours.

² Estimate includes ties, rails, fastenings, turnouts, and track laying and surfacing. It assumes ballast is available at work sites.

³ Includes replacement of buildings 100 percent, ties 80 percent, rail and turnouts 85 percent.

8-7. Water Terminal Construction

a. Approximate Planning Factors. The following planning factors give the materials and man-hours required for water terminal facilities adequate for the handling of 720 short tons of discharge dry cargo per day for 20-hour operation. This is a convenient unit because it is the wharf discharge rate of one ship, Victory-type, as given in paragraph 7-6d. The facilities include ship or lighterage wharf space, access road from wharf to road net, and minimum covered and open storage. Of the four factors given, cases I and II are based on new wharf construction, the others on rehabilitation.

- (1) *Case I.* New construction of 150 meters (500 feet) of deep-draft marginal wharf (para 7-6) and port facilities for 720 short tons per day.*

* If site conditions favor finger-type piers 150 meters by 27 meters (90 feet), 2 berths per pier, the above factors per berth continue to apply.

	1	2	3	4
1	Item	Short tons	Measure- ment tons	Man- hours
2	Timber pile marginal wharf, 150m x 18.2m	1,680	2,498	21,340
3	1.12 km of access road, asphalt-surfaced, 7.3m wide	70	87	14,000
4	3.2 km of railroad, including sidings ¹	822	710	14,500
5	10,000 sq ft/929m ² covered storage ²	65	80	1,800
6	60,000 sq ft/5,574m ² open storage			50
7	Total	2,637	3,375	51,690

¹ Based on 90-pound rail and on normal requirements for service and yard tracks and for terminal car storage.

² Based on shell-type insulated warehouses with 4-inch concrete floors.

- (2) *Case II.* New construction of 107 meters of marginal lighterage wharf

(para 7-6) and port facilities for 720 short tons per day.

	1	2	3	4
1	Item	Short tons	Measurement tons	Man-hours
2	Timber pile marginal wharf, 107m x 10.7m.	600	800	8,400
3	1.12 km of access road, asphalt-surfaced, 7.3m wide.	70	87	14,000
4	3.2 km of railroad, including sidings. ¹	822	710	14,500
5	10,000 sq ft/929m ² covered storage. ¹	65	80	1,800
6	60,000 sq ft/5,574m ² open storage.			50
7	Total -----	1,557	1,677	38,750

¹ Notes 1 and 2, case I, apply also to case II.

(3) *Case III.* Rehabilitation of 150 meters of deep-draft wharf, clearance of debris, and new construction of other terminal facilities for 720 short tons per day.

	1	2	3	4
1	Item	Short tons	Measurement tons	Man-hours
2	Repair of 150 meters of deep-water wharf. ¹	1,375	2,910	25,000
3	1.12 km of access road, asphalt-surfaced, 7.3m wide.	70	87	14,000
4	3.2 km of railroad, including sidings. ²	822	710	14,500
5	10,000 sq ft/929m ² covered storage. ²	65	80	1,800
6	60,000 sq ft/5,574m ² open storage.			50
7	Clearing debris ³ -----			2,500
8	Total -----	2,332	3,787	57,850

¹ Based on repair of cratered wharf faces by timber and V-trestle construction to a width of 18 meters.

² Notes 1 and 2, case I, apply also to case III.

³ Based on 10 percent of the man-hours in line 2.

(4) *Case IV.* Rehabilitation of 107 meters of lighterage wharf, clearance of debris, and new construction of other port facilities for 720 short tons per day.

	1	2	3	4
1	Item	Short tons	Measurement tons	Man-hours
2	Repair of 107 meters of lighterage wharf. ¹	580	920	10,500
3	1.12 km of access road, asphalt-surfaced, 7.3m wide.	70	87	14,000
4	3.2 km of railroad, including sidings. ²	822	710	14,500
5	10,000 sq ft/929m ² covered storage. ²	65	80	1,800
6	60,000 sq ft/5,574m ² open storage.			50
7	Clearing debris ² -----			1,100
8	Total -----	1,537	1,797	41,950

¹ Based on repair of cratered wharf faces by timber or steel sheet pile.

² Notes 1 and 2, case I; and note 3, case III, apply also to case IV.

b. Construction Rate for Pile-and-Timber Wharves. Normally, 1 engineer construction company constructs 150 meters of deep-draft marginal wharf, or equivalent, in about 6 days. These rates cannot be improved by using a force larger than a company on one wharf structure of these sizes because of the sequences necessary in pile driving, capping, bracing, and deck construction.

c. Demolition of Existing Facilities. Experience in the invasion of developed harbors indicates the average percentages of demolitions to be anticipated are as tabulated below. In addition, the removal of sunken wrecks or blockships may be required; normally, 2 or 3 in a small harbor, 10 or 20 in a large one. If the harbor entrance is narrow, it is usually found blocked.

	1	2
1	Facilities	Average demolition
2	Permanent wharves or quays.	30 percent very badly damaged; early repair impracticable. 30 percent heavily damaged; much debris; reasonably early repair possible. 40 percent lightly damaged; less debris; early repair practicable.
3	Port cranes -----	100 percent destroyed.
4	Port warehouses -----	50 percent to 100 percent destroyed.

d. Utilities Required at Ship Wharves.

- (1) *Fresh water.* With pressures normal in municipal water supply, one 4-inch pipeline with three 2½-inch outlets refills a Liberty ship's capacity of 115,000 gallons in 6 hours.
- (2) *Illumination.* Five-hundred-watt incandescent lamps, mounted 10.5 meters above the wharf deck and spaced at intervals of 35 meters, provide adequate illumination averaging 1 to 2 foot-candles.

e. Construction Factors for Specific Types of Deep-Draft Wharves and Approaches. The following information is based on details in TM 5-301 and TM 5-303, using woodpiles and timber deck.

	1	2	3	4
1	Type of wharf	Short tons	Measurement tons	Man-hours
2	Finger pier, 150m x 27m, with railway, 1.5m tide.	2,468	3,684	29,040
3	Finger pier, 150m x 27.4m, with railway, 7.6m tide.	2,998	4,528	35,430
4	Marginal wharf, 150m x 27.4m, with railway, 1.5m tide.	1,680	2,498	21,340
5	Marginal wharf, 150m x 27.4m, with railway, 7.6m tide.	2,008	3,021	24,610
6	Wharf approaches, 9m wide (per 30m), no railway, 7.6m tide.	86	123	3,230
7	Wharf approaches, 9m wide (per 30m), with railway, 7.6m tide.	343	501	6,800

f. Construction Factors for Specific Types of Marginal Lighterage Wharves Per 30 Meters.

	1	2	3	4
1	Type of construction	Short tons	Measurement tons	Man-hours
2	Timber pile, 10.7m wide, using 12-meter piles.	171	228.0	2,400
3	Timber crib, supporting timber bents, 10.7 meters wide.	143	193.0	2,800
4	Timber retaining wall (Wakefield pile) with earth or rubble fill.	21	30.5	1,300
5	Steel sheet piling retaining wall with earth or rubble fill.	27	25.0	1,100

g. Construction Factors for Floating Pontoon Wharves. Reference—*Pontoon Gear Manual*, 1 November 1952, Bureau of Yards and Docks, Department of the Navy. A floating wharf suitable for a Victory or Liberty ship berth is 6 pontoons wide by 72 pontoons long, or about 13 by 123 meters. Four approaches, each 4 by 18 pontoons, about 8.5 by 33 meters, are usually adequate. Total area of wharf and approaches is 2,854 square meters. The construction factors are—

	1	2	3	4
1	Floating pontoon wharves	Short tons	Measurement tons	Man-hours
2	Per 93 square meters	42	127	343
3	Wharf and approaches as above, 2,854 square meters.	1,290	3,900	10,535

h. Construction Requirements for Over-the-Beach Discharge of Cargo. Construction requirements for over-the-beach discharge of cargo include the construction of ramps, hardstands, egress roads, and beach stabilization. In general, local materials will be used. The length of the ramps varies, depending on beach gradient and tidal range. The length of the ramp can be computed by the following formula:

Beach gradient (in meters per hundred meters) $\times$ [tide range (in meters) + 1.2] = ramp length (in meters).

The man-hours required for the construction of 30 meters of various types of ramps, hardstands, and beach stabilization are as follows:

	1	2
1	Facility	Man-hours
2	Amphibious vehicle ramp, 17m wide x 30m long x .45m deep.	930
3	Landing craft ramp (LCU/LCM/LST), 8.8m wide x 30m long x .45m deep.	480
4	Hardstands and beach stabilization, 30m x 30.4m x .15m deep.	555
5	Maintenance: Ramps: 10 percent of initial effort per month. Hardstands and beach stabilization: 10 percent of initial effort per quarter.	

Note. See paragraph 8-5 for road construction factors.

8-8. Dredging

Since dredging is a slow operation, dredging harbors in a military operation should be avoided if possible. Likewise, because of the danger of damaging foundations, plans should not anticipate dredging in the close proximity of quay walls. Generally, demolition debris can be cleared in front of berthing sites by the use of dragline or clamshell cranes. If dredging of harbor areas is unavoidable, the following overall planning factors may be used as a guide. Dredging quantities vary considerably with the type of equipment used, the distance of haul to the spoil area, the method of haul, and the kind of material being excavated (sand, mud, gravel, soft rock or coral, hardrock, etc.).

	1	2	3	4	5
1	Type of dredge	Hydraulic suction ¹	Dipper	Clamshell or orange peel	Seagoing hopper ²
2	Size -----	12"-28" pipe	2-16 cu yd	1-9 cu yd	700-5,000 cu yd
3	Operating personnel -----	Varies from 12-90-man crews, depending on size of dredge and number of shifts being worked.			
4	Operating characteristics and principal use.	Soft digging, river-channel dredging.	Clay, rock, or debris excavation.	Dredging in limited areas, caisson work, debris clearance.	Outer harbor work. Spoil area may be several miles away. Designed for dredging in rough water.
5	Maximum swells affecting operations.	3'/.9m	10'/3m	10'/3m	
6	Maximum dredging depth (feet/meters).	15'-65'/4.6m-19.8m	20'-50'/6m-15.2m	10'-60'/3m-18.2m	36'-60'/11m-18.2m
7	Average daily capacity ³ (cubic yards).	5,400 (12") 28,000 (28")	2,000 (2 cu yd) 9,000 (16 cu yd)	500 (1 cu yd) 3,000 (9 cu yd)	6,500 (700 cu yd) 10,000 (5,000 cu yd)

¹ The average distance which this type of dredge pumps to a spoil area is 300-900 meters. On the Fort Peck Dam, the 28" dredge pumped 8,500-9,500 meters.

² The 700-cubic yard "Hoffman Type" dredge was designed for use in World War II. It is especially useful in cutting a channel across a shoal at a harbor entrance. In

a military operation, it is probable that all other dredging would be accomplished with local equipment or on-site expedients.

³ Dredges normally require 1 day per week shutdown for maintenance. These figures do not include maintenance delays but do include time consumed in moving the dredge along the cut area.

8-9. General Construction

a. General. This paragraph presents planning factors for engineer materials and man-hours required for construction of facilities in the following categories:

- (1) Troop camps.
- (2) Administration.
- (3) Hospitals.
- (4) Depots.
- (5) Shops.
- (6) Refrigeration and iceplants.
- (7) Personnel service buildings, including laundries, drycleaning plants, bakeries, recreation centers, and base post offices.
- (8) Prisoner-of-war camps.

b. Troop Camps.

- (1) *Standards.* Troop camp requirements are estimated in six standards intended for varying degrees of permanence.
 - (a) *Standard 1.* TOE tents; no engineer materials or effort involved.
 - (b) *Standard 2.* Class IV tents pitched by using troops; no engineer materials or effort involved.
 - (c) *Standard 3.* Buildings with floors for administration, bathhouses, infirmaries, storehouses; and kitchens. Class IV tents with floors for housing and with earth floors for all other purposes. Roads within the installations are stabilized with local

materials. Water piped from central storage tank to infirmaries, bathhouses, and kitchens. Electric distribution to buildings. Pit-type latrines.

- (d) *Standard 4.* Buildings with floors for all purposes except housing, for which there are class IV tents with floors and wood frames. Roads within the installations are stabilized with local materials. Water piped from central storage tank to infirmaries, bathhouses, kitchens, and camp exchange. Electric distribution to all facilities. Pit-type latrines.
 - (e) *Standard 5.* Buildings with floors for all purposes; otherwise, the same as standard 4 above.
 - (f) *Standard 6.* Water piped from central storage tank to latrines; latrines equipped so that waterborne, untreated sewage carried 300 meters beyond the confines of the camp; bituminous surfacing of roads within the installations; otherwise, the same as standard 5 above.
- (2) Structures will be prefabricated (metal-type) or standard (wood) frame for all climates. The following table states material and man-hour requirements, based on use of prefabricated buildings for the various standards of camps in the temperate climate, sizes from 250 to 3,000 men:

	1	2	3	4	5	6	7	8
1	Standard	Size (number of men)	Electric (kw)	Water (M gal/ day)	Site areas (acres)	Materials		Man- hours
						Short tons	Measure- ment tons	
2	1	Organic tents—no engineer materials or effort required.						
3	2	Class IV quartermaster tents erected by using service. No engineer materials or effort required.						
4	3	250	2.2	3.7	10	87	146	5,115
5		500	7.9	7.5	20	149	269	9,705
6		1,000	12.6	15.0	35	278	501	16,795
7		1,500	15.4	22.5	50	389	704	24,565
8		3,000	27.0	45.0	75	605	1,181	43,320

	1	2	3	4	5	6	7	8
1	Standard	Size (number of men)	Electric (kw)	Water (M gal/ day)	Site areas (acres)	Materials		Man- hours
						Short tons	Measure- ment tons	
9	4	250	5.4	3.7	10	127	224	8,505
10		500	17.3	7.5	20	249	481	16,500
11		1,000	31.6	15.0	35	470	901	30,055
12		1,500	39.4	22.5	50	630	1,200	41,400
13		3,000	78.0	45.0	75	1,215	2,346	82,515
14	5	250	5.5	3.7	10	160	346	9,185
15		500	17.3	7.5	20	320	713	17,075
16		1,000	31.3	15.0	35	606	1,347	31,350
17		1,500	39.1	22.5	50	840	1,882	42,075
18		3,000	77.5	45.0	75	1,691	4,125	86,305
19	6	250	5.5	6.3	10	168	356	9,525
20		500	17.4	12.5	20	358	758	18,205
21		1,000	31.4	25.0	35	676	1,430	31,620
22		1,500	39.0	37.5	50	947	1,981	43,915
23		3,000	78.4	75.0	75	1,934	4,402	90,145

c. Administration Facilities.

(1) *Standards.* Estimates are based on three standards: standard 3, standard 4, and standard 6. Standards specifications are the same as for troop camps.

(2) *Structures.* Structures will be primarily prefabricated. Material and man-hour requirements for administrative offices in temperate climate for 10,000, 25,000, and 50,000 square feet are listed in the following table:

	1	2	3	4	5	6	7
1	Standard	Size office space (M sq ft)	Electric (kw)	Water (GPD)	Materials		Man- hours
					Short tons	Measure- ment tons	
2	3	10	11.3	250	83	197	4,195
3		25	27.4	625	193	478	9,405
4		50	52.2	1,250	371	935	17,355
5	4	10	11.3	350	102	238	4,890
6		25	27.4	625	210	515	10,010
7		50	52.2	1,250	401	998	18,355
8	6	10	11.3	1,250	115	259	6,170
9		25	27.4	3,120	242	558	12,210
10		50	52.2	6,250	454	1,069	21,905

d. Hospitals.

(1) *Standards.* Estimates are based on four standards as follows:

(a) *Standard 2.* Facilities in class IV tents with some buildings (clinic, latrines, building for servicing ward

patients): hospital tents framed, personnel tents pitched by using troops with no engineer material or assistance. Water piped from central storage tank to necessary facilities. Concrete floors for tentage with frames and buildings. Waterborne

sewage in buildings, other facilities
pit latrines. Roads unimproved.
Electric distribution to all facilities.

(b) *Standard 3.* Same as standard 2 except that all sewage is waterborne, roads are stabilized, and additional buildings are provided.

(c) *Standard 4.* Same as standard 3 except that all tents are framed and

floored and additional buildings are provided.

(d) *Standard 6.* Same as standard 4 except that buildings are provided for all facilities and roads are bituminous surfaced.

(2) *Material and man-hour requirements* for 25- to 1,000-bed hospitals of the above standards are as shown in the following table.

	1	2	3	4	5	6	7	8
	Standard	Size beds	Electric (kw)	Water (M gal/ day)	Site areas (acres)	Materials		Man- hours
						Short tons	Measure- ment tons	
1								
2		25	40.7	1.25	5.1	158	310	14,510
3		50	42.2	2.5	5.1	162	316	14,830
4		100	81.2	5.0	10.1	281	511	23,710
5	2	200	104.1	10.0	13.6	361	665	31,440
6		300	146.0	15.0	18.6	537	1,008	44,820
7		500	193.9	25.0	24.7	704	1,299	59,690
8		750	248.0	37.5	31.7	890	1,609	75,390
9		1,000	276.0	50.0	38.9	1,046	1,886	87,650
10		25	52.0	1.25	5.1	228	455	19,870
11		50	68.5	2.5	5.1	258	520	21,930
12		100	111.0	5.0	10.1	439	799	36,360
13		200	184.3	10.0	13.6	686	1,338	52,700
14	3	300	246.0	15.0	18.6	934	1,853	71,710
15		500	309.0	25.0	24.7	1,206	2,411	92,710
16		750	407.0	37.5	31.7	1,578	3,254	116,960
17		1,000	503.0	50.0	38.9	1,870	3,819	138,130
18		25	69.4	1.25	5.1	317	676	23,870
19		50	77.4	2.5	5.1	349	749	25,910
20		100	135.0	5.0	10.1	591	1,196	45,900
21		200	194.7	10.0	13.6	808	1,763	60,700
22	4	300	285.8	15.0	18.6	1,128	2,433	79,835
23		500	411.1	25.0	24.7	1,552	3,414	108,355
24		750	540.5	37.5	31.7	2,057	4,642	138,520
25		1,000	660.0	50.0	38.9	2,426	5,460	165,840
26		25	67.0	1.25	5.1	400	839	28,270
27		50	77.0	2.5	5.1	432	913	30,300
28		100	144.0	5.0	10.1	817	1,650	54,465
29	6	200	208.0	10.0	13.6	1,125	2,371	70,980
30		300	302.0	15.0	18.6	1,572	3,310	96,720
31		500	435.0	25.0	24.7	2,166	4,679	131,995
32		750	575.0	37.5	31.7	2,794	6,165	168,595
33		1,000	698.0	50.0	38.9	3,296	7,196	198,395

e. Depots.

- (1) *Standards.* Estimates are based on three standards of construction for covered and open dry cargo storage and two standards for ammunition storage as follows:

(a) *Dry cargo storage.*

1. *Standard 2.* Class IV tents for all facilities requiring cover. Open storage cleared, graded, and drained. Roads graded, but not surfaced.
2. *Standard 3.* Sheds for covered storage; class IV tents with floors for administrative space; without floors for other facilities requiring cover. Roads stabilized. Railroad sidings to open storage areas. Drainage and fencing provided when required.
3. *Standard 5.* Closed buildings for covered storage and administrative facilities. Bituminous-surfaced main access roads to covered and open

storage areas; other interior roads stabilized. Railroad sidings to storage areas. Drainage and fencing provided when required. Electricity provided to all buildings.

(b) *Ammunition storage.*

1. *Standard 2.* Class IV tents for 10 percent of the ammunition tonnage and for administrative facilities. Open storage areas cleared and graded. Access roads graded but not surfaced.
2. *Standard 3.* Sheds for 10 percent of the ammunition tonnage. Buildings for administrative facilities. Access roads and parts of open storage areas stabilized with local materials. Railroad sidings to storage areas.

- (2) *Material and man-hour requirements* for storage construction of the above standards are as follows:

(a) *Dry cargo storage—covered.*

	1	2	3	4	5	6	7
1	Standard	Size (M sq ft)	Electric (kw)	Site areas (acres)	Materials		Man- hours
					Short tons	Measure- ment tons	
2	2	12	-----	1.0	0.3	0.3	200
3		25	-----	2.0	0.5	0.5	500
4		50	-----	4.0	1.0	1.0	1,000
5		100	-----	8.0	2.0	2.0	2,000
6	3	12	-----	2.5	38.0	120.0	1,640
7		25	-----	4.0	73.0	253.0	2,250
8		50	-----	6.5	137.0	495.0	4,400
9		100	-----	14.0	274.0	1,020.0	7,240
10	5	12	3.1	2.5	86.0	170.0	3,040
11		25	6.7	4.0	164.0	348.0	5,635
12		50	13.3	6.5	325.0	692.0	11,430
13		100	27.1	14.0	654.0	1,380.0	20,790

(b) *Dry cargo storage—open.*

	1	2	3	4	5	6
1	Standard	Size (M sq ft)	Site areas (acres)	Materials		Man- hours
				Short tons	Measure- ment tons	
2	2	50	4	4	6	875
3		100	8	5	7	1,435
4		200	16	8	10	2,370

	1	2	3	4	5	6
1	Standard	Size (M sq ft)	Site areas (acres)	Materials		Man- hours
				Short tons	Measure- ment tons	
5	3	50	4	7	9	1,920
6		100	8	10	12	3,195
7		200	16	18	23	5,985
8	5	100	8	285	275	12,000
9		200	16	500	520	20,000
10		400	30	920	950	35,000

(c) Ammunition storage—10 percent covered; 90 percent open.

	1	2	3	4	5	6
1	Standard	Depot capacity (tons)	Site area (acres)	Materials		Man- hours
				Short tons	Measure- ment tons	
2	2	1,000	140	3	4	7,600
3		5,000	690	12	16	30,400
4		25,000	3,450	45	60	114,000
5	3	1,000	140	18	14	8,000
6		5,000	690	112	101	33,500
7		25,000	3,450	445	420	127,600

f. Shops.

(1) For covered shop requirements, see paragraph 8-18c.

(2) Material and man-hour requirements for various standard 5 shops are as follows:

(a) Shops, general.

	1	2	3	4	5	6	7
1	Capacity (sq ft)	Site area (acres)	Electric (kw)	Water (GPD)	Materials		Man- hours
					Short tons	Measure- ment tons	
2	5,000	1.8	18	50	80	90	3,100
3	50,000	5.0	175	500	1,090	1,090	27,700

(b) Shops, special.

	1	2	3	4
1	Type	Materials		Man- hours
		Short tons	Measure- ment tons	
	<i>Ordnance:</i>			
2	Collecting point -----	2,450	2,500	98,200
3	Park -----	1,700	1,750	75,900
	<i>Transportation:</i>			
4	Marine railroad repair shop, 500-ton -----	534	737	28,500
5	Marine railroad repair shop, 1,800-ton -----	1,428	2,028	49,400

g. Iceplants and Refrigerated Storage. Material and man-hour requirements for iceplants and refrigerated storage are as follows:

	1	2	3	4	5	6	7
1	Facility	Size	Water (GPD)	Electric (kw)	Materials		Man-hours
					Short tons	Measurement tons	
2	Iceplant -----	1-ton	250	0.1	18	30	870
3	Iceplant -----	3.6-ton	1,000	10.0	23	43	1,120
4	Iceplant -----	15-ton	4,000	46.3	131	243	2,950
5	Refrigerated warehouse ---	20' x 55'	100	15.6	41	92	1,600
6	Refrigerated warehouse ---	20' x 100'	100	23.4	76	175	2,400
7	Refrigerated warehouse ---	80' x 220'	100	141.0	552	1,312	13,640

h. Personnel Service Facilities. Material and man-hour requirements for buildings are as follows:

	1	2	3	4	5	6	7
1	Description	Size	Water (M GPD)	Electric (kw)	Materials		Man-hours
					Short tons	Measurement tons	
2	Drycleaning plant, W boilerhouse --	1,000-man	4.4	5.7	12	29	1,280
3	Drycleaning plant, W boilerhouse --	2,500-man	5.4	8.5	15	39	1,440
4	Drycleaning plant, W boilerhouse --	5,000-man	8.4	23.6	31	64	2,160
5	Laundry, W boilerhouse -----	2,500-man	67.5	35.4	102	220	5,830
6	Laundry, W boilerhouse -----	5,000-man	141.0	69.0	141	312	8,020
7	Laundry, W boilerhouse -----	10,000-man	249.0	117.4	236	517	11,690
8	Bakery *	Mobile			120	99	2,462
	Base post office:						
9	Type O, Std 3 -----	11,200 sq ft		8.2	89	237	3,860
10	Type U, Std 3 -----	80,000 sq ft	0.5	49.4	458	1,589	21,765
	Recreation center:						
11	Std 2 -----	5,000-man	10.0	21.4	55	82	4,940
12	Std 3 -----	5,000-man	10.0	21.4	81	108	5,380
13	Std 4 -----	5,000-man	10.0	28.3	234	695	10,955
14	Std 5 -----	5,000-man	10.0	40.3	314	761	14,455
15	Std 4 -----	10,000-man	20.0	52.5	464	1,099	19,050
16	Std 5 -----	10,000-man	20.0	79.5	722	1,513	28,035

* Quartermaster mobile bakery requires building space to house its equipment when operating for an extended period of time on one location. These are shell buildings only.

i. Prisoner-of-War Camps.

(1) *Standards.* Estimates are based on four standards of permanence (2, 3, 4, and 5) as follows:

(a) *Standards 2.* Class IV tents with earth floors for all facilities. Bucket type latrines. Engineer effort consists of construction of security fencing, guard towers, water lines, and stabilized roads. Open ditch drainage.

(b) *Standard 3.* Buildings for bathhouse, kitchen, latrines, and gener-

ators. All other facilities in tents. Concrete floors in buildings and tents. Electricity to all buildings and tents except POW housing. Floodlights. Other construction as in standard 2.

(c) *Standard 4.* All buildings except POW housing. Electricity to all facilities. Drainage piped. Other construction as in standard 3.

(d) *Standard 5.* All accommodations in buildings. Other construction as in standard 4.

(2) *Material and man-hour requirements.*

	1	2	3	4	5	6	7	8
1	Standard	Size (number of PW)	Electric (kw)	Water (M gal/ per day)	Site Area (acres)	Materials		Man- hours
						Short tons	Measure- ment tons	
2	2	500	-----	2.5	18	131	168	10,080
3		1,000	-----	5.0	23	193	255	14,420
4		2,000	-----	10.0	40	276	364	22,020
5		4,000	-----	20.0	94	555	786	51,430
6	3	500	39.9	5.0	18	280	432	18,520
7		1,000	65.9	10.0	23	456	721	27,540
8		2,000	126.8	20.0	40	754	1,194	49,270
9		4,000	394.0	40.0	94	1,625	2,741	112,440
10	4*	500	44.0	5.0	18	351	571	23,340
11		1,000	73.1	10.0	23	559	942	35,840
12		2,000	138.3	20.0	40	975	1,692	66,280
13	5	500	47.6	5.0	18	407	801	24,650
14		1,000	73.3	10.0	23	681	1,377	38,080
15		2,000	145.5	20.0	40	1,197	2,520	70,150
16		4,000	430.4	40.0	94	2,471	5,214	146,880

* No standard 4, 4,000 man PW camp.

j. Bivouacs, Camps, and Billets.

- (1) *Bivouac areas.* The bivouac area of an infantry battalion size unit will vary from 23 acres to 1 square mile, as indicated by the situation. Considerations which affect the area required are the dispersion necessary to minimize the threat of enemy attack, the amount of cover and concealment available, and the characteristics of the terrain. The approximate minimum area required by a unit may be estimated as indicated below.

Note. Both methods should be used and the larger figure chosen.

- (a) *Vehicle dispersion.* When required dispersion of the vehicles with the unit should govern, use the following formula:

$$\frac{V \times D^2}{K} = \text{Area required, when}$$

V = Number of vehicles with the unit.

D = Desired dispersion between vehicles.

K = Conversion factor, as appropriate, to reduce the area to acres, hectares, square miles, or square kilometers.

Example: Assume that an infantry battalion has 200 vehicles and that a dispersion of 100 yards between vehicles is desired. Find the acres required.

$$\frac{200 \times (100)^2}{4,840 \text{ (sq yd per acre)}} = 413 \text{ acres.}$$

Personnel will be distributed throughout the area.

- (b) *Tent camps—capacity.* Medium general-purpose tent, normal assignment—12 to 16 men per tent; area required for an infantry battalion camp (open ground) — approximately 23 acres; estimate of area required—50 square yards per man; 100 square yards per vehicle.

(2) Data on tentage.

	1	2	3	4	5	6	7
1	Data on tentage		Surface area (sq ft)	Floor space (sq ft)	Vertical wall (height)	Weight in pounds per unit (packed)	Cubage per unit (packed)
	Type	Dimensions					
2	Assembly -----	40' x 80'	4,965	2,860	8'0"	1,000	34.35
3	Command post -----	20' 7" x 10'	1,079	172	5'6"	257	9.90
4	General purpose, large -----	18' x 52'	2,158	936	5'6"	420	34.50
5	General purpose, medium.	16' x 33'	1,491	523	5'6"	330	22.50
6	General purpose, small -----	(¹)	812	199	5'0"	116	8.00
7	Kitchen, flyproof -----	12' x 18'	1,384	216	6'0"	202	14.20
8	Maintenance shelter -----	18' x 26'	1,770	485	4'8"	500	26.30
9	Paulin, Large -----	20' x 40'	800	-----	-----	160	4.20
10	Paulin, small -----	12' x 17'	204	-----	-----	57	2.30
11	Screen, latrine ² -----	8' x 52'	416	144	-----	45	1.10

¹ Tent, general purpose, small, is a six-sided pyramidal tent. Length of side 8' 9", eave height, 5', height of peak 8' 6".

² Limited standard; will be issued until exhausted.

	1	2	3	4	5	6	7
1	Data on cold-weather tentage		Surface area (sq ft)	Floor space (sq ft)	Vertical wall (height)	Weight in pounds per unit (packed)	Cubage per unit (packed)
	Type	Dimensions					
2	Arctic, 10-man (8340-262-3684).	8' 6" ea side (six-sided pyramidal).	34' 6" diameter (circular tent).	198.90	3 ft	76.0	7.30
3	Hexagonal (8340-269-1372).	6' 7½" ea side (six-sided pyramidal).	25' 3" diameter (circular tent).	113.20	2 ft	48.0	3.80
4	Mountain, 2-man (8340-254-9017).	54" wide x 82' long.	285	30.75	12 in	9.1	0.79
5	Frame-type, insulated sectional (8340-262-2399).	16' long x 16' 7" wide.	868	265.30	-----	2,264.0	192.80

(3) Space allowances for quarters under theater of operations conditions.

(a) Normal—40 square feet floor space and 40 cubic feet airspace per person.

Rich farming country ----- 5 per inhabitant.
 Cities ----- 2 per inhabitant.
 Average American City ----- 20 per vacant dwelling.
 Vacant buildings and dwellings in average city (civilians may be caused to move to vacancies in order to concentrate military activities). 10 percent of population.
 With civilians furnishing subsistence ----- 10 percent of population for 1 week.

(b) Emergency—50 percent of the above.

(4) *Billets*. In hostile or liberated territory, the capacity of a locality for billeting is approximately as follows:

k. Housing Requirements in Addition to Troop Camps. In addition to those troop housing facilities provided for normal functions of

troops, it is usually necessary to provide additional installations, based on the following percentages of the theater population.

	1	2
1	Facility	Percentage of theater troops
2	Recreation center -----	5% of total.
3	Reception center -----	5% of total.
4	Replacement depot -----	3% of total.
5	Casual camp -----	1% of total.
6	Ground troop training center -----	5% of all ground forces.
7	Service force training center -----	5% of all service troops.
8	Labor camp -----	5% of prewar population in area.
9	Temporary refuge for displaced persons -----	5% of prewar population in area.
10	Military prisoners -----	1% of total.
11	Undesirable civilians (saboteurs, etc.) -----	5% of prewar population in area.

l. Office Space. Space allowances for offices under theater of operations conditions: 60 square feet per person employed plus 10 square feet per drafting board.

m. Prefabricated and Standard Frame Buildings.

- (1) The following are the basic units for portable prefabricated, V-lock steel buildings:
 - (a) Barrack with basic dimensions of 20' x 20', 30' x 40', 40' x 50', 8' high and expandable in 10-foot length increments.
 - (b) Warehouse with basic dimensions of 40 feet x 100 feet x 20 feet high and expandable in 20-foot length increments.
 - (c) Shop with basic dimensions of 40 feet x 100 feet x 20 feet high and expandable in 10-foot length increments.
 - (d) Units of (a), (b), and (c) above are interconnectable without use of especially fabricated parts.
- (2) Standard frame buildings are constructed in various dimensions and designs from standard materials listed in TM 5-302. Because of the large lumber and man-hour requirements involved, this construction is normally restricted to special-purpose buildings, such as refrigerated warehouses, ice-

plants, laundries, drycleaning plants, special shops, and facilities for frigid climates.

8-10. Bulk Petroleum Storage and Distribution

a. General. See paragraphs 5-13 through 5-24 for petroleum; paragraph 5-14 for types and capacity of carriers in general use; and paragraph 7-14 for sizes and capacities of pipelines. See TM 5-343 for descriptions, sizes, and operating characteristics of pipeline equipment; AR 701-5 for supply service responsibilities; and TM 10-1100-series for petroleum pipeline and terminal operating procedures and techniques. A complete pipeline system includes tanker discharge facilities and receiving tank farm at a port or beach (marine terminal); 1 or more parallel pipelines; tank farms are generally spaced from 80 to 120 km apart along the system and vary in size from 50,000 barrels capacity to 1,000,000 barrels capacity, depending on logistical supply needs and specified theater levels of supply; dispensing facilities are provided at tank farms and supply points. Engineer troop units construct petroleum distribution systems.

b. Pipelines. Four-, six-, and eight-inch diameter, lightweight pipe is standard for military pipeline systems. On level terrain, pump stations are spaced 13 km apart for 4-inch lines and 27 km apart for 6-inch and 8-inch lines. Submarine ship-to-shore lines are 12-inch heavy

welded lines running from the offshore tanker mooring to the receiving tank farm. They are provided by the Corps of Engineers as part of

the equipment in marine terminal installations (c below) and should be designed to unload T2 tankers in 24 hours.

1	160 km pipeline	2 Short tons	3 Measurement tons	4 Construction		5 Rate (km/day) *
				Man-hours		
2	4-inch W pump stations -----	2,360	3,340	59,900		12.9
3	6-inch W pump stations -----	3,230	6,330	62,500		12.6
4	8-inch W pump stations -----	4,770	9,100	91,800		8.4

* Rate for one engineer construction battalion augmented by one engineer pipeline construction company.

c. Tank Farms.

- (1) To determine the amount of tank farm construction required in a theater of operations, the planner should first determine the required theater level of supply. This may vary from a 30-day level to a 60-day level, depending on the distance of tanker haul and probability of tanker losses through enemy action. Using the planning factor stated in paragraph 7-16, the amount of construction required may be estimated by the following formula:

Number of divisions (plus air support)
x 6,000 barrels per day x number days level
of supply—available existing storage in theater=Total storage construction requirement.

- (2) The following table provides data for estimating tank farm construction

along a pipeline system. These data include tanks, pipe manifolds to the individual tanks, pumps, valves, etc., necessary for operation of the tank farms. Current doctrine for dispersion of facilities prescribes that not over 250,000 barrels of bulk storage capacity will be constructed within 6.5 km of another tank farm. Tank farm complexes listed below are groupings of 20,000-barrel or 250,000-barrel capacity installations with sufficient intermediate pipeline and accessories to meet the dispersion criteria. Marine terminals listed below are used at ports or beaches and include the receiving tank farm and all facilities for offshore mooring of tankers and pumping petroleum products to the tank farm.

1	Installation	2 Capacity (thousand bbl)	3 Site area (thousand yd sq)	4 Short tons	5 Measurement tons	6 Construction man-hours
2	Marine terminal with submarine pipeline -----	200	130	1,515	1,360	48,500
3	Marine terminal with submarine pipeline -----	400	220	3,700	3,800	112,300
4	Marine terminal with submarine pipeline -----	1,000	520	7,670	7,400	242,700
5	Tank farm with 6-inch pipe and accessories ----	50	50	390	230	14,100
6	Tank farm with 6-inch pipe and accessories ----	100	87	595	295	21,100
7	Tank farm with 8-inch pipe and accessories ----	150	89	710	345	27,600
8	Tank farm with 8-inch pipe and accessories ----	200	90	760	360	34,400
9	Tank farm with 8-inch pipe and accessories ----	250	120	995	410	41,500
10	Tank farm complex with 8-inch pipe and accessories.	400	180	2,180	1,712	78,500
11	Tank farm complex with 8-inch pipe and accessories.	600	270	3,495	3,055	122,500
12	Tank farm complex with 8-inch pipe and accessories.	800	360	4,760	4,335	164,800
13	Tank farm complex with 8-inch pipe and accessories.	1,000	480	5,355	4,540	193,400

d. Pipeline Communications. A petroleum distribution system requires continuous communication between tank farm dispatches, pump station operators, and pipeline patrol units. The Signal Corps provides both radio-voice and teletypewriter equipment for this communication system. Teletypewriter is used primarily for hourly recording of the flow of products along the pipeline and the transmission of dispatching instructions between tank farms (para 4-24).

e. Pipeline Operations.

- (1) Pipeline systems for distributing bulk petroleum fuels within the theater will be operated by the petroleum intersectional command (POLIC). The POLIC under the operational control of the quartermaster, theater army logistical command (TALOG QM) is an intersectional and interzonal command extending from the base section as far forward into the combat zone as possible. Liquid petroleum fuels can be moved most effectively and economically in bulk form. The POLIC distribution plan maximizes the use of pipelines. Distribution of packaged petroleum fuels (5 gallon cans and 55 gallon drums) will be restricted to the extent essential for adding flexibility to the system. Containers of POL smaller than 55-gallon drums are palletized when shipped to air terminals for subsequent air-landed delivery.

(2) *Supervisory and Operating Organizations.*

- (a) *Supervisory:* The following organizations are supervisory:

1. *Headquarters and headquarters company, quartermaster petroleum intersectional command (TOE 10-201D).* Normal requirement: 1 per 2 or more QM petroleum groups, and as required in the theater of operations. May be assigned to Army or higher headquarters for petroleum logistics planning and co-

ordination prior to the establishment of a communications zone.

2. *Headquarters and headquarters detachment, quartermaster petroleum group (TOE 10-202D).* Normal requirement: 1 per single intersectional military petroleum distribution system operated by 2 or more QM petroleum operating battalions; and 1 per 2 to 5 separate military petroleum distribution systems, each operated by a QM petroleum operating battalion. May be assigned to Army or higher headquarters for petroleum logistics planning and coordination prior to the establishment of a communications zone.
3. *Headquarters and headquarters company, quartermaster petroleum operating battalion (TOE 10-206D).* Normal requirement: 1 per 2 to 5 QM petroleum depot companies. May be assigned to Army or higher headquarters for petroleum logistics planning and coordination prior to the establishment of a communications zone.
- (b) *Operating.* The quartermaster petroleum depot company (TOE 10-377) operates military petroleum terminal and pipeline facilities and performs organizational maintenance thereon. It is capable of operating 2 petroleum terminals each with a maximum storage capacity of 500,000 barrels; and 6 pumping stations or approximately 90 miles of pipeline. Additional terminal and pipeline operating elements may be organized as separate platoons.

8-11. Nuclear Powerplants

(fig. 8-1)

a. General.

- (1) Nuclear powerplants are designed to operate for extended periods without refueling, thereby reducing the need for logistic support. Nuclear fuel cores currently can sustain operations for from 1 to 2 years. As nuclear

technology is expanded, this core life will be increased to 3 or more years. A nuclear fuel shipment with a gross weight of 1 ton yields the equivalent energy of 17,000 tons of diesel fuel.

- (2) Another military advantage of nuclear powerplants is the ability to respond quickly to large load changes, making precise power possible over a wide range of load demands. Also, because nuclear powerplants do not require combustion air, they may be used in underground, hardened sites for indefinite periods. In areas where conventional fuel costs are high, nuclear power may have the additional advantage of being more economical.
- (3) The principal disadvantage of nuclear power is the high initial cost of a plant. Additional disadvantages include the precautions necessary because of radiation hazards and the disposition of radioactive wastes.
- (4) A nuclear powerplant controls the energy released as heat by nuclear fission, utilizing it to perform useful work. This can be accomplished by various processes, the most common of which initially produce steam. In a pressurized water system, heat from the reactor coolant is given up to water in a secondary system by the use of a tube-in-shell heat exchanger. Where water is available, it is employed to remove excess heat. In arid areas, excess heat is removed by air-blast coolers. In a boiling water reactor system, steam is generated directly in the reactor. The steam produced by either system then is used to operate turbine-generators producing electricity, provide space heating, distill sea water in desalting operations, or any combination of these functions. Nuclear powerplants can be operated in environmental temperatures between -65° and $+100^{\circ}\text{F}$.

b. Station Powerplants. Permanent nuclear powerplants, capable of electrical outputs in excess of 1,000 kw, are in operation. Such plants generally would be utilized at permanent camps and stations.

c. Portable Powerplants. Also capable of producing electrical power in excess of 1,000 kw, portable nuclear powerplants are the most readily adaptable to current military requirements. Prepackaged in the United States, such plants can be transported by air to any location in the world and set up for operation within 90 days after arrival on site. At the close of semipermanent operations, they can be relocated for use elsewhere.

d. Mobile Powerplants. Barge-mounted nuclear powerplants are being designed and constructed with electrical outputs of 10,000 kw and higher. Such floating plants, because of their mobility, are particularly attractive for military applications. To fill the gap in satisfying power requirements of less than 1,000 kilowatts, the Army has a mobile, trailer-mounted nuclear powerplant in the final stages of development. This 300-kw plant should be available in the late 1960's for use by armies in the field. A land-mobile plant capable of an output above 3,000 kw also is under development.

e. Cost. Although the initial cost of nuclear powerplants is high in comparison with fossil-fueled (coal and oil) plants, operating cost savings may in time make up the difference. The greater the power requirements, the sooner comparative overall costs tend to equalize. Currently, nuclear powerplants are competitive in cost per kilowatt hour in many world areas where fossil fuel is expensive (fig. 8-1 depicts an economic comparison of nuclear versus oil-fired powerplants).

f. Construction. Construction time varies with the size and type of plant. Stationary plants take no longer than a conventional plant of the same capacity, barge-mounted plants take about 3 years, and portable plants can be manufactured in less than 3 years.

NUCLEAR VS OIL-FIRED POWER PLANTS AN ECONOMIC COMPARISON

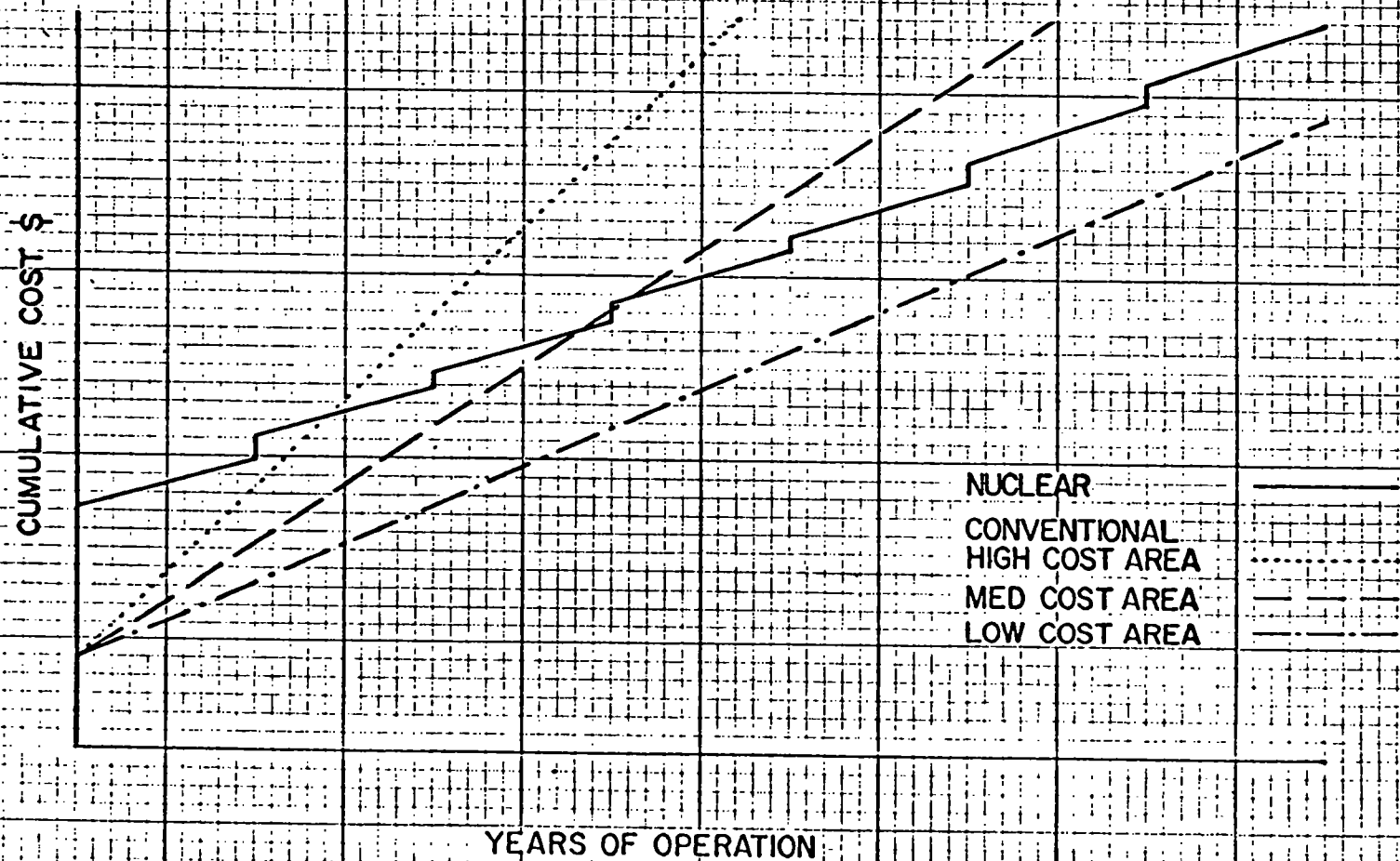


Figure 8-1

g. Plant Designation. The plant designation system used in the Army Nuclear Power Program has four elements:

- (1) The first letter indicates the degree of mobility.

S—Stationary—Permanent construction; not designed for subsequent relocation.

P—Portable—Prepackaged at the factory for transportability and rapid assembly at site.

M—Mobile—Can be moved intact, or virtually intact; may or may not operate in transit.

- (2) The second letter indicates the power range.

L—Low—100 to 1000 KWe.

M—Medium—Between 1000 to 10,000 KWe.

H—High—10,000 KWe or higher.

- (3) The arabic numeral indicates the order of initiation of plants with the same first two letters.

- (4) The capital letter following the arabic numeral indicates the order of initiation of field plants of the same type. Absence of the final letter indicates that the plant is an engineering or proto type model. *For example*, the SM-1, located at Fort Belvoir, Va., is the prototype of a stationary, medium powerplant. The SM-1A, located at Fort Greeley, Alaska, is the first constructed field plant of that type.

h. Operators. Nuclear Powerplant Operators (Army MOS 358) are a carefully selected group of career service enlisted men of the Armed Forces. Their training includes a 1-year course of instruction at the Army Nuclear Powerplant Operators School, Fort Belvoir, Va. Following graduation, training in field plants continues in an on-the-job status for approxi-

mately another year, after which the individual becomes a qualified Nuclear Powerman. Each Nuclear Powerman, in addition, specializes as a maintenance technician in the mechanical, electrical, or instrumentation areas, or as a health physicist.

i. Maintenance. A nuclear powerplant requires little more maintenance than a conventional powerplant. All essential items are duplicated, permitting repairs and maintenance during operation. A shutdown period of 720 hours per year can be expected.

j. Health and Safety. Policies regulating Army nuclear reactor systems health and safety procedures are found in AR 385-80.

k. Summary. Nuclear power provides distinct logistic, operational and, in certain areas, economic advantages over conventional systems in military applications. Although high initial costs are currently a deterrent to widespread utilization, technological advances continually reduce the initial investment promising competitive status in the foreseeable future. In tactical situations, where logistic considerations outweigh costs, the advantages of nuclear power are unexcelled.

8-12. Airfield Construction

a. Construction Effort Required for Airfields in a Theater of Operations. This paragraph is useful for broad planning purposes only. For oversea theaters, it provides estimates for computing engineer troop support required to construct U.S. Air Force installations. None of the factors in this section is suitable for the detailed planning required for construction of specific installations. Reference should be made to TM 5-330 for more detailed planning data.

- (1) The table below gives the number of engineer construction battalion months required to accomplish emergency, minimum, and full operational construction of different type bases. A factor of 75 percent of total construction of a new base can be used to estimate the average construction required to reconstruct an existing base

which makes use of a site where an airfield of some type does exist or has existed. These are average factors.

They are not applicable to extreme climatic conditions and mountainous or swampy terrain.

	1	2	3	4	5
1	Type base	Critical aircraft *	New base		
			Emergency operational	Minimum operational	Full operational
	Heavy bomber:				
2	One wing -----	B-52	12.0	18.0	30.0
3	One squadron -----	-----	10.0	15.0	18.0
	Medium bomber:				
4	One wing -----	B-47	11.0	16.0	27.0
5	One squadron -----	-----	10.0	14.0	22.0
	Tactical bomber:				
6	One wing -----	B-66	9.0	11.0	15.0
7	One squadron -----	-----	8.0	10.0	13.0
	Tactical fighter or fighter interceptor:				
8	One wing -----	F-105	6.0	9.0	13.0
9	One squadron -----	-----	5.0	8.0	11.0
	Transport, heavy:				
10	One wing -----	C-97	9.0	11.0	15.0
11	One squadron -----	-----	8.0	10.0	13.0
	Transport, medium:				
12	One wing -----	C-119	2.5	6.0	12.5
13	One squadron -----	-----	2.0	4.0	6.5
	Troop carrier, assault:				
14	One squadron -----	C-123	1.5	2.5	5.0
	Air depot:				
15	One wing on base operating own base -----	-----	11.0	19.5	37.5
16	One wing on base as tenant organization -----	-----	4.0	12.5	29.0

* Aircraft requiring longest runway in each category.

- (2) The number of engineering construction battalion months required to construct the different type bases is calculated from the man- and equipment-hour workload needed to build each base. This is determined by specifying for each type base the kinds and numbers of facilities required for the performance of the function of the units supported by the base; i.e., AACS station, housing, runway, etc. Each of these facilities is then broken down into the kinds and number of elements composing it; i.e., paved surfaces, shops, messhalls, and latrines. A man-

and equipment-hour factor, such as 1.45 hours per square yard of paved surface, is then applied to each of these elements to compute the total man-hours required to construct each element. The number of hours for all elements is then added together to give the total man- and equipment-hours required to construct the base. This total is then converted to construction battalion months by the factor; 140,000 man- and equipment-hours of construction is equivalent to 1 engineer construction battalion month.

b. Conversion of Battalion Months of Effort to Engineer Battalion. In order to compute manning, training, and equipping requirements, it is necessary to convert engineer battalion months as given above to construction battalion. Thus, a construction task requiring 8 engineer construction battalion months can be accomplished by 1 engineer construction battalion working for 8 months, 2 battalions for 4 months, or 4 battalions for 2 months, etc. In emergencies, immediate and urgent requirements may develop for the construction of complex installations such as a heavy bomber base. Theoretically, this could be done by concentrating enough battalions in the area to perform the required number of months of construction. However, the effect of oversaturation comes into play, and the efficiency of the work diminishes as the personnel, equipment, and supplies of the different battalions create interference. On the basis of these saturation considerations, the following table presents estimates of the number of battalions which can be employed most efficiently.

	1	2
1	Battalion months of construction effort required	Number of battalions best utilized
2	25-35 -----	4
3	15-24 -----	3
4	5-14 -----	2
5	Less than 4 -----	1

8-13. Signal Construction Factors

a. Estimated Time Required for Line Work Operations.¹

1	2	3
Operations	Man-hours placing	Removing
Laying out and staking line open wire:		
150-foot span—mile -----	15.0	-----
Material distribution:		
Lightweight metal poles—each.	0.3	-----
Round wooden poles—each.	0.5	-----

See footnotes at end of table.

1	2	3
Operations	Man-hours placing	Removing
Wire and accessory materials 150-foot span—4 pairs—mile.	6.0	-----
Insulated wire and accessory materials—150-foot span—mile.	2.0	-----
Lead cable and accessory materials—per reel.	1.8	-----
Holes—pole:		
Dug by hand—per hole	2.0	-----
Dug by machine—per hole.	0.5	-----
Dug by blasting, hand drilling—per hole.	5.0	-----
Holes—anchor:		
Dug by hand—4 x 4 log—each.	3.0	-----
Dug by machine—log or plank—each.	0.7	-----
Dug by machine—patent—each.	0.8	-----
Dug by hand— $\frac{5}{8}$ -inch rock—each.	3.0	-----
Assembling hardware and placing crossarm—open wire:		
Lightweight metal—4 pins—each.	0.3	0.2
Round wood pole—8 pins—each.	0.5	0.2
Setting poles (erecting, back-filling, and tamping):		
Lightweight metal—each	0.4	0.3
20-foot round—each -----	1.5	1.0
30-foot round—each -----	2.0	1.2
Guying:		
Placing anchor and back-filling:		
Lightweight metal poles—each.	0.6	-----
Round pole log or plan—each.	1.8	-----
Patent—each.	1.0	-----
Placing and tensioning guying:		
W-145, 109 GS, or similar—each.	0.8	0.4
Wire messenger, 2.2M—each.	1.0	0.4
Wire messenger, 6M or 10M—each.	1.5	0.8

1	2	3
Operation	Man-hour placing	Removing
Installing line wire (placing, sagging, and tying in):		
1 pair—mile -----	25.0	13.0
4 pair—mile -----	40.0	18.0
Installing messenger wire:		
6 and 10M messenger—mile.	36.0	25.0
16M messenger—mile ----	50.0	30.0
Placing lead-covered cable on messenger:		
11 to 101 pair—mile ----	125.0	80.0
Above 101 pair—mile ----	164.0	116.0
Placing insulated wire on existing pole line—mile.	12.0	7.0
Ground surface construction:		
Spiral—4—mile" -----	2.6	2.6
Wire, WD-1/TT, or similar—mile. ³	1.5	1.0

1	2	3
Operation	Man-hour placing	Removing
Buried construction (using cable plow LC-236 ()/MT:) ¹		
Spiral-4:		
1 cable—mile -----	8.5	3.0
2 cables, same trench—mile.	10.0	4.0
Jute-covered, tape-armored—mile.	45.0	65.0
Constructing overhead crossing for insulated wire each (installing messenger and rings, pulling in wire).	5.2	-----

¹ Time indicated is maximum for any operation.

² For surveying, staking line, testing sections, and policing, add 12 man-hours per mile for spiral-4 and 6 man-hours per mile for wire WD-1/TT.

³ Does not cover operation in jungle, arctic, or desert areas.

b. Characteristics of Round Telephone Poles (American Standard).

Class	1	2	3	4	5	6	7
Minimum top circumference (inches) -----	27	25	23	21	19	17	15
Transverse breaking loads (pounds) -----	4,500	3,700	3,000	2,400	1,900	1,500	1,200
Type	Length (ft)	Approximate average weight (pounds)					
Western cedar, northern cedar, creosoted pine.	20	700	600	500	400	300	225
		720	600	540	350	300	230
		635	555	479	418	353	310
	25	850	720	600	480	400	320
		1,020	780	600	515	420	300
		898	808	686	602	508	423
	30	1,000	850	730	610	500	420
		1,320	1,170	870	630	520	420
		1,241	1,076	921	780	672	573
	35	1,200	1,000	850	750	650	560
		1,620	1,380	1,060	820	720	510
		1,603	1,410	1,213	996	865	733

Northern and western cedars are furnished butt treated; pine is treated full length. An estimate of the shipping space required for poles—

$$\frac{\text{Average weight (pounds)} \times \text{constant}}{40} = \text{Measurement tons.}$$

Values of the constant are—

Cedars = 0.052.

Pine = 0.026.

c. Commercial-Type Telephone Switchboard Capacity—Position Comparison.

Local switchboard capacity—lines	Positions
100 -----	1 or 2
400 -----	7 basic
600 -----	10 basic
800 -----	11 basic
1,000 -----	14 basic
1,200 -----	16 basic
1,600 -----	22 basic
2,000 -----	27 basic
2,800 -----	40 basic
3,600 -----	60 basic

Toll switchboard capacity—line	Positions
100 -----	15
200 -----	25
300 -----	34
400 -----	40

d. Local (Common Battery Manual) Call Handling Time and Traffic Distribution.

(1) *Call handling time.*

One operator handles 150 calls per operator hour.

Two operators handle 200 calls per operator hour.

Three operators handle 220 calls per operator hour.

Four operators handle 225 calls per operator hour.

Five or more operators handle 230 calls per operator hour.

(2) *Distribution of traffic (average situation).*

	Percentage
Local calls -----	40
Outgoing trunk calls -----	30
Incoming trunk calls -----	30

e. Toll (Common Battery Manual) Call Handling Time and Traffic Distribution.

(1) *Call handling time.*

One operator handles 20 calls per operator hour.

Two operators handle 25 calls per operator hour.

Three operators handle 30 calls per operator hour.

Four operators handle 35 calls per operator hour.

Five operators handle 40 calls per operator hour.

(2) *Distribution of traffic (average situation).*

	Percentage
Outward -----	55
Inward -----	30
Through (switchboard) -----	15

f. Normal Telephone Instrument Requirements.

- (1) One per general officer.
- (2) One per two field grade officers.
- (3) One per four company grade officers.
- (4) One per 50 or 100 enlisted men, depending on whether troop basis is on TOE basis or personnel are operating as part of a large headquarters staff.
- (5) One per 50 or 100 square feet of office space.

g. Space Requirements.

(1) *Common battery manual telephone switchboard (fixed plant).*

Line capacity	Switchboard positions	Space requirements (square feet)
100 -----	1	450
100 -----	2	525
200 -----	2	590
200 -----	4	750
400 -----	7	1,400
600 -----	10	1,725
800 -----	11	1,850
1,000 -----	14	2,100
1,200 -----	16	2,280
1,600 -----	22	3,150
2,000 -----	27	3,150
2,800 -----	40	4,260

(2) *Dial central office.*

Line capacity		Approximate space requirements	
Initial	Expandable to—	Dimensions (ft)	Area (sq ft)
200	400	30 x 55	1,650
400	600	32 x 55	2,080
600	1,000	35 x 70	2,450
1,000	1,400	35 x 82	2,870
1,400	2,000	40 x 95	3,800
2,000	3,000	45 x 110	4,950
3,000	4,800	49 x 119	5,851

(3) *Fixed communication center.*

Size	Space requirements (square feet)
Small	950
Medium	1,900
Large	3,000

(4) *Fixed radio—transmitter station.*

Size	Number of transmitters	Space requirements (square feet)
Small	Up to 7	Up to 3,000
Medium	8 to 17	3,000 to 13,000
Large	More than 18	13,000 and up

(5) *Fixed radio—receiver station.*

Size	Number of receivers	Space requirements (square feet)
Small	Up to 15	Up to 4,000
Medium	16 to 45	4,000 to 8,000
Large	More than 46	8,000 and up

(6) *Antenna field.¹*

Type	Space requirements (acres)
Transmitter:	
Small (5 to 7 antennas)	15 to 25
Medium (15 antennas)	45 to 75
Large (25 to 35 antennas)	100 to 400
Receiver:	
Small (8 antennas)	35 to 50
Medium (25 to 30 antennas)	200 to 300
Large (50 to 60 antennas)	450 to 600

¹ Space is based on average conditions existing; however, depending on type antennas equipment used, location, and terrain, space requirements may vary.

Section III. MAINTENANCE

8-14. General

This section contains maintenance planning data for staff officers on division, corps, field army, theater army logistical command, area command, and theater staffs within a theater of operations.

8-15. Maintenance Personnel Requirements

a. General. The following factors are useful in determining personnel requirements for maintenance support of materiel, computation of workloads and backlogs, and programing and scheduling of maintenance operations:

- (1) Supported equipment density.
- (2) Repair frequency. (This may be expressed as the number or percentage of items of equipment to be repaired within the operational work cycle; i.e., month or year.)

- (3) Maintenance man-hours per item per operational work cycle.

- (4) Productive man-hours per repairman per operational work cycle. (This includes *only* direct man-hours applicable to the maintenance workload. Nonproductive time will include unit or team movement time; lost time caused by casualties; and other non-MOS tasks such as guard, perimeter defense, and area damage control duties.)

b. Quantitative Personnel Requirements.

- (1) The factors listed in *a* above may be employed in formulas to determine quantitative personnel requirements as follows:

$$\text{Supported equipment density} \times \frac{\text{Repair frequency}}{\text{per operational work cycle}} = \text{Workload (items) per operational work cycle.}$$

$$\text{Available man-hours per operational work cycle} - \text{Nonproductive time (man-hours)} = \text{Productive man-hours per operational work cycle.}$$

$$\frac{\text{Workload (items) per operational work cycle} \times \frac{\text{Maintenance man-hours}}{\text{per item per operational work cycle}}}{\text{Productive man-hours per operational work cycle}} = \text{Maintenance personnel required.}$$

The final product is the total number of repairmen required to support a given number and type of items of equipment in an organization. Whether the number of personnel required are direct support/general support or organizational repairmen will depend upon the factors used. For planning purposes, the following factors have been developed for a 12-hour workday.*

Non-productive time (hrs/min)

	Day	Month	Year
Cat I -----	6:05	185:09	2,221:49
Cat II -----	5:37	170:58	2,051:37
Cat III (MOB) ---	4:27	135:27	1,625:22
Cat III (FIXED) -	4:07	125:19	1,503:44

Available productive time (hrs/min)

	Day	Month	Year
Cat I -----	5:55	180:06	2,161:11
Cat II -----	6:23	194:17	2,331:23
Cat III (MOB) ---	7:33	299:48	2,757:38
Cat III (FIXED) -	7:53	239:56	2,879:16

Total time (hrs/min)

	Day	Month	Year
All Units -----	12:00	365:15	4,383:00

- (2) The number of maintenance repairmen required to support all the equipment in an organization for a given level of maintenance is the sum of those required for each type of equipment. If this sum is not a whole number, the suggested authorization is as follows:

Range of sum	Authorization
0.00-0.49 -----	0
0.50-1.09 -----	1
1.10-2.09 -----	2
2.10-3.49 -----	3
3.50-4.49 -----	4
4.50-5.49 -----	5
5.50-6.49 -----	6
6.50-7.49 -----	7
7.50-8.49 -----	8
8.50-9.49 -----	9
9.50-10.49 -----	10
Etc. -----	Etc.

* All time is based upon 365.25 days per year and 30.437 days per month.

- (3) Maintenance time factors for selected items and types of equipment are listed in tables I, II, and III, below.

c. Qualitative Personnel Requirements.

- (1) Personnel are allocated by the various MOS codes in conformance with the type of work to be performed. Determination of the number of repairmen of a given MOS required by an organization may be made by adding together the number of repairmen required for each type of equipment of that organization to which the given MOS is applicable.
- (2) In addition to the various light- and heavy-equipment repairmen required, certain common- or service-type specialists must be provided. While these personnel are required, they normally cannot be considered to be 100 percent productive.

d. Other Functions.

- (1) *Inspections.* Technical inspection of materiel and equipment is performed by staff or supervisory personnel of the supply service as appropriate.
- (2) *Technical assistance.* Technical assistance to supported units is provided by liaison, supervisory, and contact repair team personnel in the normal course of their duties. Therefore, time required for this function by non-supervisory personnel is included in the repair time factors that are quoted.
- (3) *Parts supply.* Personnel required to provide repair parts and maintenance operating supplies will vary, depending on equipment density and utilization. These factors will be reflected in the unit's authorized stockage list. As a general guide for planning the following table may be used:

REPAIR PARTS SUPPLY		
1	2	3
1	Level of supply	ASL item per man or MFCT
		Stock control clerk Warehouseman
2	Organizational Supply:	
	Category I -----	320 190
	Category II -----	345 205
	Category III (MOB) -----	410 245
	Category III (FIXED) -----	430 255
3	Direct Support Supply Category II.	485 145
4	General Support Supply Category II.	485 145

REPAIR PARTS SUPPLY		
1	2	3
1	Level of supply	ASL item per man or MFCT
		Stock control clerk Warehouseman
5	Depot Support Supply Category III (MOB).	575 172
6	Depot Support Supply Category III (FIXED).	600 180

Note. The factors indicated by the table provided above represents the culmination of data collected from worldwide sources over a 4-year period, to establish the requirements for personnel to operate a supply element or unit. These factors do not enjoy an official status but have been proven several times, in operating units, to have approximately 90 percent reliability.

Table I. Maintenance Time Factors for Selected Items of Equipment

1	2	3	4	5
Item or type of equipment	Man-hours required for organizational maintenance per month ¹	Number of times direct support/general support maintenance performed per year	Man-hours required for direct support/general support maintenance per job	Total man-hours required for direct support/general support maintenance per year
<i>Chemical ^a</i>				
2 Apparatus, filling, field, landmine, M2 -----	5.00	4.00	1.00	4.00
3 Breathing apparatus, compressed air, ABC-M15A1.	35.00	4.00	6.34 2.00	8.00
4 Compressor, reciprocating, power-driven, 7 CFM, M1 and M1A1.	25.00	4.00	11.54 6.00	24.00
5 Compressor, reciprocating, power-driven, flame-thrower, 3½ DFM, AN-M4.	20.00	3.00	5.00	15.00
6 Decontaminating apparatus, portable, DS2, 1½-qt, ABC-M11.	19.00	3.00	3.00	9.00
7 Decontaminating apparatus, power-driven trailer-mounted, 200 gal, M8A2.	40.00	3.00	3.00	24.00
8 Decontaminating apparatus, power-driven, truck-mounted, M3A3.	100.00	----	----	52.00
9 Decontaminating apparatus, power-driven trailer-mounted, M9.	106.00	----	----	64.00
10 Dispensing pump, hand-driven, M2A1 -----	2.00	2.00	1.00	2.00
11 Filter unit, gas-particulate, GED or EMD, 600 or 1200 CFM, M9, M10, and M10A1.	30.00	4.00	5.00	20.00
12 Filter unit, gas-particulate, hospital, six-man, 12 CFM, M7 and ABC-M7A1.	9.00	2.00	3.00	6.00
13 Filter unit, gas-particulate, tank, three-man, 12 CFM, ABC-M8A2, four-man, 12 CFM, M8A3; and five-man, 20 CFM, M13.	22.00	2.00	6.00	12.00
14 Flamethrower, mechanized, main armament, APC-mounted, M10-8, and turret-mounted, M7A1-6.	60.00	4.00	12.00	48.00
15 Flamethrower, portable, M2A1-7 -----	37.00	----	----	14.00

See footnotes at end of table.

1	2	3	4	5
Item or type of equipment	Man-hours required for organizational maintenance per month ¹	Number of times direct support/general support maintenance performed per year	Man-hours required for direct support/general support maintenance per job	Total man-hours required for direct support/general support maintenance per year
16 Generator, smoke, mechanical, pulse jet, ABC-M3A3.	73.00	----	----	52.00
17 Heater, water, oil, skid-mounted, 600 GPH, M2	40.00	4.00	3.00	12.00
18 Mask, protective, field, M9A1, and ABC-M17	5.00	4.00	0.17	0.68
19 Mask, protective, tank, M14, ABC-M14A1, and ABC-M14A2.	5.00	4.00	0.17	0.68
20 Mechanism, valve replacement, M1	8.00	2.00	4.00	8.00
21 Riot control, agent disperser, helicopter- or vehicle-mounted, M4.	15.00	2.00	2.00	4.00
22 Riot control agent disperser, portable, M3	45.00	3.00	2.00	6.00
23 Riot control agent, disperser, skid-mounted, GED, 5,000 CFM, M2.	40.00	4.00	5.00	20.00
24 Service kit, portable flamethrower-riot control agent disperser, M27.	25.00	4.00	3.00	12.00
25 Service unit, flamethrower, truck-mounted, M4	60.00	6.00	6.00	36.00
26 Air conditioner, 9,000-36,000 Btu	5.10	----	----	42.50
27 Air conditioner, W cooling tower, 60,000 Btu	5.30	----	----	34.50
28 Air conditioner, tlr-mtd, gas-eng driven, 26,500 Btu.	6.30	----	----	27.50
29 Auger, earth, skid-mtd, gas-eng driven	5.30	----	----	66.00
30 Asphalt mixing and paving set, 120 tons/hr	262.80	----	----	3,334.00
31 Backhoe, crane-shovel, $\frac{3}{4}$ -2 cu yd	12.50	----	----	53.50
32 Batching plant, agg, 100-ton	3.20	----	----	87.00
33 Batching plant, cement, 75-ton	1.30	----	----	134.50
34 Boat, brg erection, 19-27-ft gas-eng driven	15.60	----	----	51.50
35 Boiler, steam, high-pressure tlr-mtd, 200 HP	51.40	----	----	249.00
36 Breaker, paving, gas-eng driven, 100-lb class	16.00	----	----	53.00
37 Breaker, paving, pneumatic, 25-80-lb class	3.20	----	----	11.50
38 Bucket, clamshell, $\frac{3}{4}$ -2 cu yd	4.50	----	----	15.00
39 Compressor, air, elec, 1.2-16 CFM	3.80	----	----	22.00
40 Compressor, air, elec, 18-60 CFM	4.60	----	----	27.00
41 Compressor, air, reciprocating, gas-eng driven, 15-55 CFM.	5.10	----	----	66.00
42 Compressor, air, reciprocating, gas-eng driven, 60-105 CFM.	5.80	----	----	41.00
43 Compressor, air, rotary, 125-315 CFM	6.30	----	----	46.00
44 Compressor, air, rotary, 600 CFM	10.80	----	----	51.50
45 Compressor, air, rotary, 60 CFM	3.80	----	----	28.00
46 Conversion and stor unit, carbon-dioxide, 16,000-lb cap.	11.40	----	----	70.00
47 Conversion unit, carbon-dioxide, 260/hr, elec	24.20	----	----	65.00
48 Conveyor, belt, pneumatic tires, elec (all)	3.20	----	----	40.50
49 Conveyor, belt, pneumatic tires, gas-eng driven, 300 tons/hr (all).	19.20	----	----	34.50
50 Cooling tower, liq, elec, 4 sec	11.50	----	----	51.00
51 Crane-shovel, crawler-mtd 5-10-ton	34.80	----	----	70.50
52 Crane-shovel, crawler-mtd 40-ton	58.80	----	----	97.50
53 Crane-shovel, trk-mtd, 2-10-ton	35.80	----	----	171.50
54 Crane-shovel, trk-mtd, 20-25-ton	76.80	----	----	214.50

See footnotes at end of table.

1	1	2	3	4	5
	Item or type of equipment	Man-hours required for organizational maintenance per month 1	Number of times direct support/general support maintenance performed per year	Man-hours required for direct support/general support maintenance per job	Total man-hours required for direct support/general support maintenance per year
55	Crane, tractor mounting, 2½-6-ton -----	2.20	----	----	12.00
56	Crane, tractor, towed, 10-20-ton -----	1.30	----	----	7.50
57	Crusher, jaw, gas-eng driven, 15-ton -----	31.30	----	----	98.50
58	Crushing and screening plant, gas-eng driven, 25 cu yd. -----	63.80	----	----	181.50
59	Crushing, and screening unit, gas-eng driven, crawler-mtd 100 tons/hr. -----	123.00	----	----	90.50
60	Crushing, screening, and washing plant, diesel and elec, 225 tons/hr. -----	241.80	----	----	217.00
61	Distillation eqp set, skid-mtd diesel-eng driven, 150-300 GPH. -----	32.10	----	----	56.50
62	Distillation eqp set, skid-mtd gas-eng driven, 40-60 GPH. -----	29.90	----	----	54.50
63	Distributor, bituminous material, tk-type, gas-eng driven tlr-mtd, 1,250-gal. -----	14.90	----	----	11.50
64	Distributor, bituminous material, tk-type, gas-eng driven trk-mtd, 800-gal. -----	11.30	----	----	13.50
65	Distributor, liq, bituminous material, tankless-type, gas-eng driven, 350 GPM. -----	7.40	----	----	7.50
66	Distributor, water, tk-type, gas-eng driven, trk-mtd, 1,000-gal. -----	14.90	----	----	28.00
67	Distributor, water, tankless-type, gas-eng driven, tlr-mtd, 400 GPM. -----	7.30	----	----	15.50
68	Ditching machine, gas-eng driven crawler-mtd -----	16.30	----	----	30.00
69	Drill, pneumatic, drifter, wheel-mtd, 220-lb class. -----	1.30	----	----	6.50
70	Drilling machine, percussion, skid-mtd, gas-eng driven. -----	2.70	----	----	62.50
71	Drilling machine, rotary, skid-mtd, gas-eng driven, 4½ 5½-in. -----	3.30	----	----	66.50
72	Drive unit, aerial tramway-cableway, gas-eng driven. -----	13.10	----	----	71.00
73	Dryer, agg, gas-eng driven, tlr-mtd, 30-tons/hr -----	11.30	----	----	16.50
74	Dryer, agg, gas-eng driven, tlr-mtd, 120-tons/hr -----	12.30	----	----	50.00
75	Elevator, bucket-type, gear-driven, 80-150-tons/hr. -----	1.30	----	----	13.50
76	Fairlead attachment, 2-40-ton -----	0.70	----	----	7.50
77	Feeder, agg, chain-driven, 400 tons/hr -----	1.30	----	----	16.50
78	Finishing machine, concrete-paving, gas-eng driven, 20-25 ft. -----	4.50	----	----	21.50
79	Fire and salv eqp set, marine -----	77.60	----	----	210.00
80	Fire-fighting eqp set No. 3, tlr-mtd, 500 GPM -----	----	----	----	65.50
81	Fire-fighting eqp set No. 21, Army acft crash, trk-mtd. -----	----	----	----	83.00
82	Fire-fighting eqp, GM, tlr-mtd, 100 GPM -----	----	----	----	52.50
83	Fire-fighting eqp, trk-mtd W tlr, REDSTONE -----	----	----	----	105.50
84	Genr and chg plant, acetylene, stlr-mtd -----	102.60	----	----	107.50
85	Genr and chg plant, carbon-dioxide, stlr-mtd -----	41.80	----	----	85.00

See footnotes at end of table.

	1	2	3	4	5
1	Item or type of equipment	Man-hours required for organizational maintenance per month ¹	Number of times direct support/general support maintenance performed per year	Man-hours required for direct support/general support maintenance per job	Total man-hours required for direct support/general support maintenance per year
86	Genr and chg plant, hydrogen-carbon-dioxide, W.	116.90	----	----	261.50
87	Genr and chg plant, oxy-nitrogen, 20-ton, liq-oxy.	242.60	----	----	241.00
88	Genr and chg plant, oxy-nitrogen, 5-ton, liq-oxy.	204.20	----	----	251.00
89	Genr and chg plant, oxy-nitrogen, W genr -----	64.90	----	----	162.00
90	Genr set, gas-eng driven, 0.5-3 kw -----	14.80	----	----	20.00
91	Genr set, diesel-eng driven, 15-60 kw -----	20.30	----	----	107.00
92	Genr set, diesel-eng driven, 100-500 kw -----	35.20	----	----	116.00
93	Genr set, gas-eng-driven, 5-10 kw -----	18.30	----	----	69.50
94	Gradation con unit, agg, tlr-mtd -----	15.70	----	----	40.50
95	Grader, road, towed, 6 ft 6 in blade -----	3.20	----	----	28.00
96	Grader, road, mtz, diesel-eng driven, 6 x 4 -----	36.10	----	----	94.50
97	Grader, road, mtz, diesel-eng driven, 4 x 4 -----	38.50	----	----	112.50
98	Heater, bitumen, gas-eng driven, 3-car -----	6.50	----	----	16.50
99	Heater, concrete mixer, hot water, 800 GPH -----	5.00	----	----	17.50
100	Hypochlorination unit -----	3.50	----	----	----
101	Ice-making plant, block, 3-15 tons/hr -----	----	----	----	79.00
102	Intrenching machine, cmbt, high-speed, wheel-mtd.	34.30	----	----	115.50
103	Kettle, heating, bitumen, gas-eng driven, 750-gal.	4.70	----	----	17.00
104	Kettle, heating, bitumen, gas-eng driven, tlr-mtd, 165-gal.	3.80	----	----	15.50
105	Launcher, M48 tk chassis, for 40- and 60-ft brg----	3.20	----	----	47.50
106	Loader, belt-type, diesel-eng driven, 10-30 cu yd/min.	3.60	----	----	62.00
107	Loader, bucket-type, diesel or gas-eng driven, 3 cu yd/min.	32.20	----	----	67.50
108	Loader, scoop-type, diesel eng driven, 4-wheel, 1½-2½ cu yd.	34.60	----	----	44.50
109	Logging eqp set, trk-mtd -----	11.80	----	----	41.00
110	Lubricating and svc unit, tlr-mtd, gas-eng driven.	5.4-	----	----	28.00
111	Magnet, sweeper, road, W gas-eng driven genr----	2.50	----	----	45.00
112	Mine-planting eqp, mech -----	----	----	----	27.00
113	Mixer, bituminous material, diesel-eng driven, tlr-mtd.	11.30	----	----	55.00
114	Mixer, bituminous material, gas-eng driven, tlr-mtd.	6.60	----	----	32.50
115	Mixer, concrete, tlr-mtd, gas-eng driven, 6-16 cu ft.	5.30	----	----	28.50
116	Mixer, rotary tiller, diesel-eng driven, SP -----	7.80	----	----	62.00
117	Mixer, rotary tiller, gas-eng driven, tlr-mtd -----	5.40	----	----	59.00
118	Outboard motor, 5-25 BHP -----	4.80	----	----	25.00
119	Paver, concrete, gas-eng driven, 34E -----	70.30	----	----	166.50
120	Paving machine, bituminous material, gas-eng driven, crawler-mtd.	28.80	----	----	150.00

See footnotes at end of table.

1	2	3	4	5
Item or type of equipment	Man-hours required for organizational maintenance per month ¹	Number of times direct support/general support maintenance performed per year	Man-hours required for direct support/general support maintenance per job	Total man-hours required for direct support/general support maintenance per year
121 Pipeline eqp set, const, trk-mtd -----	13.00	-----	-----	22.50
122 Planter, mech, landmine -----	-----	-----	-----	27.50
123 Pneumatic tool and compressor outfit, tlr-mtd, 55 CFM. -----	-----	-----	-----	20.50
124 Pneumatic tool and compressor outfit, trk-mtd, 210 CFM. -----	25.90	-----	-----	26.00
125 Power unit, gas, 50-55 BHP -----	1.90	-----	-----	32.00
126 Pump assy, rotary, power-driven or percussion -----	16.80	-----	-----	15.00
127 Pump, centrifugal, base-mtd, elec-driven, ½-2 HP. -----	1.60	-----	-----	49.50
128 Pump, centrifugal, deep-well, gas-eng driven, 200 GPM, 200-ft head. -----	16.80	-----	-----	31.50
129 Pump, centrifugal, frame-mtd, gas-eng driven, 50-115 GPM. -----	5.20	-----	-----	29.50
130 Pump, centrifugal, gas-eng driven, base-mtd, 60-166 GPM. -----	13.00	-----	-----	27.00
131 Pump, centrifugal, gas-eng driven, base-mtd, 175-500 GPM. -----	19.20	-----	-----	27.00
132 Pump, centrifugal, gas-eng driven, tlr-mtd, 500-2,100 GPM. -----	22.30	-----	-----	37.00
133 Pump, centrifugal, pneumatic-driven, 150-175 GPM. -----	11.10	-----	-----	14.50
134 Rehab plant, landing-mat, PSP -----	-----	-----	-----	28.00
135 Roller, mtz, gas-eng driven, med to hv -----	25.20	-----	-----	55.00
136 Roller, towed, pneumatic-tired, 4-wheel, hv -----	6.70	-----	-----	3.00
137 Roller, towed, pneumatic-tired, 13-wheel -----	8.50	-----	-----	7.00
138 Roller, towed, sheepsfoot, 2 and 3 drums -----	3.80	-----	-----	2.50
139 Rooter, road, cable-op, 24-in depth -----	3.80	-----	-----	2.50
140 Saw, chain, gas-eng driven, 24-36-in. -----	3.80	-----	-----	14.50
141 Saw, chain, elec-driven, 24-in. -----	1.60	-----	-----	3.00
142 Saw, chain, pneumatic, 24-in. -----	1.90	-----	-----	5.00
143 Saw, radial, overarm, woodworking, 10-16-in. blade. -----	2.60	-----	-----	15.50
144 Sawmill, circular, stationary, 50-60-in. blade -----	2.80	-----	-----	43.50
145 Scraper, earthmoving, towed, 12-18 cu yd -----	9.40	-----	-----	8.50
146 Stlr, elec rep shop, 6-ton -----	4.90	-----	-----	1,588.00
147 Stlr, maint, mach shop, 12-ton -----	6.30	-----	-----	3,121.00
148 Stlr, rep parts, shop van, 6-ton -----	4.50	-----	-----	29.50
149 Stlr, tk, 6-ton, 1,500-gal -----	5.90	-----	-----	9.00
150 Shop eqp, contact maint, trk-mtd -----	4.30	-----	-----	1,553.00
151 Shop eqp, GP rep, stlr-mtd -----	24.50	-----	-----	3,101.00
152 Shop eqp, org rep, lt trk-mtd -----	6.30	-----	-----	3,100.00
153 Shop eqp, woodworking, base-maint, tlr-mtd -----	20.40	-----	-----	63.50
154 Shovel front, crane-shovel, crawler-mtd, ¾-2 cu yd. -----	3.60	-----	-----	27.00
155 Snow-removal unit, gas-eng driven, trk-mtd -----	-----	-----	-----	198.00
156 Spray outfit, paint, one-gun, W compressor (all). -----	4.60	-----	-----	26.50

See footnotes at end of table.

	1	2	3	4	5
1	Item or type of equipment	Man-hours required for organi- zational mainte- nance per month ¹	Number of times direct support/general support maintenance performed per year	Man-hours required for direct support/general support maintenance per job	Total man- hours required for direct support/ general support maintenance per year
157	Spreader, agg, towed, 8-ft spread -----	2.20	----	----	9.00
158	Spreader, concrete, gas-eng driven, 25-ft spread----	19.20	----	----	18.00
159	Spreader, sand, traction-powered, 25-ft spread (all).	1.90	----	----	14.00
160	Stor and transport unit, dry ice, 1-ton -----	1.30	----	----	15.50
161	Subgrader, form-riding, gas-eng driven, 25-ft range.	21.40	----	----	61.50
162	Sweeper, rotary, towed, gas-eng driven -----	6.00	----	----	7.50
163	Tamper, back-fill, pneumatic -----	1.30	----	----	2.50
164	Tank, asphalt, stor, W steam coils, 4,000-gal -----	3.60	----	----	2.00
165	Tank, stor, liq-oxy, stir-mtd, 9-ton -----	11.40	----	----	47.00
166	Tank, stor, liq-oxy, skid-mtd, 35-ton -----	11.40	----	----	24.50
167	Tool outfit, pioneer, ptbl elec tools -----	18.20	----	----	73.00
168	Tractor, full-tracked, diesel-eng driven, air-trans.	27.50	----	----	107.00
169	Tractor, full-tracked, diesel-eng driven, med-----	33.20	----	----	139.00
170	Tractor, full-tracked, diesel-eng driven, 12,100-17,000 DBP.	33.20	----	----	119.00
171	Tractor, full-tracked, diesel-eng driven, hv-----	34.60	----	----	139.00
172	Tractor, walking, power-driven, wheel-mtd, 20 HP.	19.30	----	----	27.00
173	Tractor, wheeled, ind, diesel-eng driven, 20,025-27,000 DBP.	34.60	----	----	157.00
174	Tractor, wheeled, ind, gas-eng driven, 8,000-7,775 DBP.	27.50	----	----	51.00
175	Tlr, bolster, 2½-ton -----	6.50	----	----	4.50
176	Tlr, bolster, 9-ton -----	5.40	----	----	5.50
177	Tlr, cgo, ¼-3-ton -----	3.80	----	----	6.50
178	Tlr, flat-bed, 8-10-ton -----	5.40	----	----	9.00
179	Tlr, low-bed, 60-ton -----	6.30	----	----	9.00
180	Tlr, tk, 1,500-gal -----	5.90	----	----	9.50
181	Tlr, tractor, dump, diesel-eng driven, 13 cu yd----	44.00	----	----	154.50
182	Tramway set, aerial, gas-eng driven, 1,500-3,000-ft.	----	----	----	39.00
183	Trk, bolster, 2½-ton -----	2.60	----	----	4.50
184	Trk, dump, 15-ton, diesel-eng driven -----	27.50	----	----	156.50
185	Trk, flat-bed or stake, 5-ton -----	3.30	----	----	3.00
186	Trk, map repro, 2½-ton (all) -----	6.00	----	----	17.50
187	Water purification eqp set, 600 GPH, tlr-mtd-----	17.80	----	----	38.50
188	Water purification eqp set, 1,500 GPH trk-mtd.	24.30	----	----	78.00
189	Water purification eqp set, 3,000 GPH, base-mtd, trk-mtd.	24.30	----	----	56.50
190	Winch drum, power-op, gas-eng driven, 2-drum single speed, 1½-2-ton.	5.40	----	----	22.00
191	Winch drum, power-op, diesel-eng driven, 5½-ton.	1.30	----	----	46.50
192	Winch drum, power-op, gas-eng driven, 4-drum.	5.50	----	----	51.50

See footnotes at end of table.

1	1	2	3	4	5
	Item or type of equipment	Man-hours required for organizational maintenance per month ¹	Number of times direct support/general support maintenance performed per year	Man-hours required for direct support/general support maintenance per job	Total man-hours required for direct support/general support maintenance per year
	<i>Medical</i>				
193	Tech med eqp (all) ^{2,4} -----	1.50	3.00	6.00	18.00
	<i>Ordnance ⁵</i>				
	<i>Vehicles</i>				
194	Truck, truck tractor, 2½-ton and below (except dump). -----	31.67	3.00	22.00	66.00
195	Truck, dump, 2½-ton -----	47.50	3.00	33.00	99.00
196	Truck, truck tractor, 5-ton up to 10-ton (except dump). -----	47.50	3.00	33.00	99.00
197	Truck, dump, 5-ton -----	63.34 = 760 hr	3.00	44.00	132.00 = 892
198	Truck, truck tractor, 10-ton and over -----	71.26	3.00	49.50	148.50
199	Dolly, 2-wheel, up to 10-ton -----	6.30	3.00	4.40	13.20
200	Dolly, 4-wheel, 10-ton and over -----	12.70	3.00	8.80	26.40
201	Trailer, 2-wheel, under 1½-ton -----	6.30	3.00	4.40	13.20
202	Trailer, 1½-ton -----	12.70	3.00	8.80	26.40
203	Trailer, 2-ton up to 25-ton -----	15.80	3.00	11.00	33.00
204	Trailer, 25-ton -----	19.00	3.00	13.20	39.60
205	Carrier, cargo and personnel (all types) -----	58.10	3.00	13.20	132.00
206	Guns and howitzers, self-propelled (all types) -----	72.62	3.00	55.00	165.00
207	Tank, light -----	72.62	3.00	55.00	165.00
208	Tank, medium -----	101.67 = 1220	3.00	77.00	231.00 1451
209	Tank, heavy -----	101.67	3.00	77.00	231.00
210	Vehicle, landing or recovery -----	101.67	3.00	77.00	231.00
	<i>Artillery</i>				
211	Gun, 75-mm, AA -----	33.34	5.40	30.00	162.00
212	Gun, 90-mm and 120-mm AA -----	40.00	5.40	36.00	194.00
213	Gun, 155-mm -----	40.00	5.40	36.00	194.00
214	Gun, 280-mm -----	80.00	5.40	72.00	388.80
215	Howitzer, 75-mm -----	26.67	5.40	24.00	129.60
216	Howitzer, 105-mm -----	26.67	5.40	24.00	129.60
217	Howitzer, 155-mm and 8-inch -----	40.00	5.40	36.00	194.40
218	Launcher, rocket, 4.5-inch -----	6.67	5.40	6.00	32.40
219	Launcher, rocket, 318-mm -----	20.00	5.40	18.00	97.20
220	Launcher, rocket, 762-mm -----	20.00	5.40	18.00	97.20
	<i>Turret Artillery</i>				
221	Gun, 40-mm, AA, dual, SP -----	33.34	5.40	60.00	324.00
222	Gun, tank, 76-mm -----	26.67	5.40	48.00	259.20
223	Gun, M47 tank, 90-mm -----	26.67	5.40	48.00	259.20
224	Gun, M48 tank, 90-mm -----	20.00	5.40	36.00	194.40
225	Gun, tank, 120-mm -----	26.67	5.40	48.00	259.20
226	Gun, 155-mm SP -----	40.00	5.40	72.00	388.80
227	Howitzer, 105-mm SP -----	26.67	5.40	48.00	259.20
228	Howitzer, 155-mm and 8-inch SP -----	40.00	5.40	72.00	388.80
	<i>Sighting and Fire Control Equipment:</i>				
229	Telescope, straight tube -----	5.67	0.96	4.00	3.84
230	Binocular -----	5.67	0.96	4.00	23.00

See footnotes at end of table.

1	1	2	3	4	5
	Item or type of equipment	Man-hours required for organizational maintenance per month ¹	Number of times direct support/general support maintenance performed per year	Man-hours required for direct support/general maintenance per job	Total man-hours required for direct support/general support maintenance per year
231	Board, plotting, sound ranging -----	34.00	0.96	24.00	23.00
232	Corrector, wind, sound ranging -----	2.84	0.96	2.00	1.92
233	Circle, aiming -----	17.11	0.96	12.00	11.52
234	Compass -----	1.41	0.96	1.00	0.96
235	Finder, range tank -----	5.67	0.96	4.00	3.84
236	Instrument, spotting -----	28.35	0.96	20.00	19.20
237	Mount, periscope -----	5.67	0.96	4.00	3.84
238	Mount, quadrant -----	2.84	0.96	2.00	1.92
239	Mount, sight -----	2.84	0.96	2.00	1.92
240	Mount, telescope -----	7.08	0.96	5.00	4.80
241	Periscope -----	8.50	0.96	6.00	5.76
242	Quadrant, range -----	5.67	0.96	4.00	3.84
243	Quadrant, elevation -----	4.25	0.96	3.00	2.88
244	Quadrant, gunners -----	2.84	0.96	2.00	1.92
245	Setter, fuse, powered -----	17.11	0.96	12.00	11.52
246	Setter, fuse, manual -----	1.41	0.96	1.00	0.96
247	Sight, other than computing or reflex -----	2.84	0.96	2.00	1.92
248	Sight, computing -----	5.67	0.96	4.00	3.84
249	Sight, reflex -----	2.84	0.96	2.00	1.92
250	Sight, unit -----	9.92	0.96	7.00	6.72
251	Telescope, B. C. -----	21.26	0.96	15.00	14.40
252	Telescope, elbow -----	4.25	0.96	3.00	2.88
253	Telescope, panoramic -----	24.09	0.96	17.00	16.32
254	Telescope, panoramic other than M100 -----	11.34	0.96	8.00	7.68
	<i>Quartermaster ²</i>				
	Light equipment:				
255	Burner, oil stove, tent -----	1.00	2.00	0.50	1.00
256	Heater, duct-type, 250,000 Btu -----	30.00	5.00	10.00	50.00
257	Heater, immersion-type -----	7.50	1.00	0.50	0.50
258	Heater, space, coal or oil -----	0.50	1.00	1.00	1.00
259	Heater, water, immersion -----	7.50	6.00	0.50	3.00
260	Lantern, gas, 1½-pt cap -----	7.50	2.00	1.00	2.00
261	Outfit, cooking, small det -----	0.25	1.00	1.00	1.00
262	Sewing machines (all) -----	7.50	---	---	---
263	Stove, gas, one-burner -----	0.25	1.00	1.00	1.00
	Heavy equipment:				
264	Bakery plant, tlr-mtd -----	30.00	2.00	20.00	40.00
265	Bath unit, tlr-mtd, 24-showerhead -----	20.00	4.00	60.00	240.00
266	Cleaning machine, fuel can/drum -----	16.00	2.00	10.00	20.00
267	Clothing rep shop, tlr-mtd -----	20.00	2.00	20.00	40.00
268	Crane-truck, whs -----	20.00	2.00	8.00	16.00
269	Delousing outfit -----	16.00	2.00	4.00	8.00
270	Ldry, mbl, 2-tnr type -----	35.00	4.00	40.00	160.00
271	Pumping assy, 50 GPM -----	17.00	2.00	3.00	6.00
272	Pumping assy, 225 GPM -----	19.00	2.00	8.00	16.00
273	Pump (1,200-gal tk trk) -----	16.00	6.00	1.00	6.00
274	Pump (5,000-gal tlr) -----	17.00	2.00	8.00	16.00

See footnotes at end of table.

1	2	3	4	5
Item or type of equipment	Man-hours required for organizational maintenance per month ¹	Number of times direct support/general support maintenance performed per year	Man-hours required for direct support/general support maintenance per job	Total man-hours required for direct support/general support maintenance per year
275 Stlr, refrg, 7½-ton -----	26.00	1.00	15.00	15.00
276 Shoe rep shop, tlr-mtd -----	20.00	2.00	20.00	40.00
277 Textile rep shop, tlr-mtd -----	20.00	2.00	20.00	40.00
278 Tractor, wheeled, whs, 4,000- and 7,500-lb -----	18.00	4.00	12.00	48.00
279 Trk, lift, fork, gas, 4,000- and 4,500-lb -----	18.00	4.00	12.00	48.00
280 Trk, lift, fork, gas, 6,000-lb -----	19.00	4.00	12.00	48.00
281 Trk, lift, fork, gas, 15,000-lb -----	20.00	4.00	18.00	72.00
Canvas and leather items:				
282 Fly tent wall, large -----	Negl	1.00	0.50	0.50
283 Liner, tent, GP, large -----	Negl	1.00	2.00	2.00
284 Paulin (all types) -----	Negl	2.00	0.50	1.00
285 Shelter half -----	Negl	5.00	0.25	1.25
286 Tent, aerial cable splicer -----	Negl	1.00	0.75	0.75
287 Tent, comd post; maint shelter; and GP, med. -----	Negl	1.00	3.00	3.00
288 Tent, GP, large -----	Negl	1.00	4.00	4.00
289 Tent, kitchen, flyproof -----	Negl	1.00	0.50	0.50
290 Tent, wall, large -----	Negl	1.00	2.50	2.50
291 Tent, wall, small -----	Negl	1.00	1.50	1.50
Textile items:				
292 Armor, body -----	Negl	0.25	3.00	0.75
293 Bag, barracks -----	Negl	0.10	0.25	0.025
294 Bag, carrying, ammo -----	Negl	0.15	0.50	0.075
295 Bag, duffel; canvas, water, sterile; and water, canvas, duck. -----	Negl	0.15	0.25	0.0375
296 Bag, waterproof, cloth -----	Negl	0.05	0.25	0.0125
297 Belt, cartridge -----	Negl	0.15	0.25	0.0375
298 Belt, pistol; and magazine, BAR -----	Negl	0.10	0.25	0.025
299 Blanket, bed, olive-green, ¾-lb -----	Negl	0.25	0.50	0.125
300 Carrier, wire cutter and intrench shovel -----	Negl	0.15	0.25	0.0375
301 Case, canvas, dispatch -----	Negl	0.05	0.50	0.025
302 Case, first aid -----	Negl	0.10	0.25	0.025
303 Cover, canteen -----	Negl	0.15	0.10	0.015
304 Fld pack, cgo and cmbt -----	Negl	0.10	0.50	0.05
305 Personal clothing ⁷ -----	----	----	----	----
306 Pocket, ammo magazine -----	Negl	0.10	0.50	0.05
307 Poncho -----	Negl	0.10	0.75	0.075
308 Sleeping bag -----	Negl	0.20	0.50	0.10
309 Sling, carrying bag -----	Negl	0.10	0.10	0.01
310 Suspenders, fld pack -----	Negl	0.10	0.25	0.025

¹ A month is based on 30 working days.

² Does not include maintenance required for truck, tank, or trailer chassis.

³ See SB-70.

⁴ For planning purposes, technical medical equipment density may be calculated by relating item density to bed requirements as follows:

For bed requirements of 100 ----- Technical medical equipment density is 75.

For bed requirements of 400 ----- Technical medical equipment density is 200.

For bed requirements of 1,000 ----- Technical medical equipment density is 350.

For bed requirements of 10,000 ----- Technical medical equipment density is 3,000.

⁵ Includes services other than scheduled inspections.

⁶ For data pertaining to office machine repair and shoe repair, see AR 810-32.

⁷ 1.5 man-hours per man per year.

Table II. Maintenance Time Factors for Quartermaster Air-Type Equipment

	1	2	3	4	5	6
1	Type of equipment	Minutes re- quired per pack or repack inspection	Minutes re- quired per routine inspection	Man-hours required for organ- izational maintenance	Man-hours required for direct support/gen- eral support maintenance	Minutes re- quired per maintenance inspection
	Aerial delivery containers:					
2	A-7, A-21, and A-22 -----	--	--	1	1	--
	Parachutes:					
3	Parachute, cgo extraction, 15- and 22-ft ----	6	2	2	8	20
4	Parachute, cgo, 64-ft -----	--	2	3	35	90
5	Parachute, cgo, 100-ft -----	--	2	5	50	120
6	Parachute, cgo, G-1A -----	6	2	3	8	35
7	Parachute, cgo, G-13 -----	6	2	3	9	35
8	Parachute, pers, back, 28-ft -----	9	2	2	2	35
9	Parachute, pers, main, 35-ft -----	6	2	2	7	30
10	Parachute, pers, res, 24-ft -----	6	2	1	3	30
11	Parachute, pilot, cgo-type -----	6	2	2	2	20
	Platforms:					
12	Platform, 11-ft -----	--	--	2	25	--
13	Platform, 15-ft -----	--	--	2	35	--
14	Platform, 22-ft, and trk, inf eqp -----	--	--	2	40	--
15	Platform, 6,000-lb -----	--	--	2	30	--

Table III. Common Repair Operations on Quartermaster Air-Type Equipment

	1	2
1	Type of repair	Time required (average)
2	Section replacement (ea) -----	3.5-4 hr
3	Suspension line replacement (ea) ----	45 min
4	Patching canop or canvas (ea) -----	30 min
5	Harness replacement (ea) -----	30 min
6	Bridle loop replacement (ea) -----	10 min
7	Diagonal backstrap replacement (ea) -----	1 hr

8-16. Maintenance Control

a. General. This paragraph outlines a workload control system designed for use by organizational and direct support maintenance. The system sets forth the means of computing and controlling the maintenance backlog and general policies applicable thereto. The workload control system is a managerial tool used to balance actual workload against the workload that a maintenance facility is capable of assuming. It is intended to be used as a guide only and must be flexible in application. The system is based on the fact that a maintenance

facility has a certain number of man-hours to expend on the accomplishment of its mission during a given period of time and that the workload should, in general, be limited to that capacity. This permits the programing of work to allow maximum concentration upon a large number of small jobs, if required; a smaller number of large jobs, if desired; or any combination of both.

b. Objectives. The objectives of the workload control system are as follows:

- (1) To establish a criterion or factor, in terms of man-hours, that can be used in determining whether an item can be repaired at the direct support maintenance level or whether it must be evacuated.
- (2) To establish, in terms of manhours, the unit production potential.

c. Value. The fundamental principle of direct support maintenance is to repair and return items of material to service as rapidly as possible. The capability of a unit to perform in this manner is limited by the type and quantity of tools, quality of personnel and available

production time. The value of the system is its ability to relate these factors and determine the unit capacity.

d. Factors. The workload control system makes use of the following computations, which make up the basic factors upon which it is based:

- (1) *Man-hours.* The man-hour computation is made by deriving the total number of man-hours actually available from the total number of man-hours theoretically available. *For example*, a repair section has 11 productive item repair personnel assigned. Since it normally works 12 hours per day, there are theoretically 132 item repair man-hours available (12×11). Department of the Army policy and local conditions will determine percentages that must be deducted from this total in order to arrive at the number of man-hours actually available. These percentages cover such nonproductive operations as movement time, administrative activities, maintenance of operating equipment, or other contingencies, and will vary, depending upon the function or work activity involved. As a hypothetical example, an item repair section might actually have available 76.6 man-hours per day for the function of repair.
- (2) *Workload.* Higher headquarters normally prescribes the workload, expressed in days, authorized to be on hand in the company (or section) at any one time. This usually represents the maximum number of days in which the company should complete the items scheduled for repair. When multiplied by the actual number of man-hours available each day, it represents the total number of actual man-hours available to the company (or section) for a given period of time. *For example*, if the prescribed workload is 3 days, the total number of actual item repair man-hours available to the section is 229.8 (3×76.6).

e. Utilization. Utilization of the workload control system in a repair section of a direct support maintenance company is described below. The first example illustrates application when a standard repair time factor is available. The second illustrates application when the repair time factor has not been established.

- (1) *Example 1.* The standard repair time factor for the repair of an item is 0.5 man-hours. The prescribed maximum workload for the section is 3 days (229.8 man-hours). Based on the standard repair time factor, the section can repair 459.6 items within the 3-day period. The section has on hand 4 job orders covering a total of 314 items. A new job order (number 5) is received covering 50 items, or 25 man-hours.
 - (a) The workload control system is applied by subtracting the total number of items on hand from the total number that can be repaired within the prescribed 3-day limit (459.6-314). The resulting figure of 145.6 items indicates that job order number 5 can be completed within the 3-day limit.
 - (b) If the calculation had indicated that job order number 5 could not be completed within the 3-day limit, the company may have either evacuated the job to the next higher maintenance unit, or assigned the job to the section with the understanding that additional jobs would have to be evacuated until the number of items on hand had been reduced.
- (2) *Example 2.* A standard repair time factor has not been developed for the repair of a certain item. The prescribed maximum workload is 3 days (229.8 man-hours). The section has on hand 12 job orders for the repair of items requiring an estimated 210 man-hours to complete. A new job order (number 13) requiring an estimated 25 man-hours to complete is received.

(a) The workload control system is applied, in this instance, by subtracting the total number of man-hours required to complete the jobs on hand from the total number of man-hours actually available (229.8-210). The resulting figure of 19.8 man-hours indicates that job order number 13 cannot be completed within the 3-day limit.

(b) The company may, therefore, evacuate the job to the next higher maintenance unit, or assign the job to the section with the understanding that no additional jobs can be accepted until the total number of man-hours of work has been reduced.

8-17. Maintenance Float and Direct Exchange Criteria

a. Maintenance float is that quantity of major and principle or secondary items of equipment required and authorized for stockage with direct support maintenance units. Such equipment is required for replacement of unserviceable items of equipment for which immediate repair cannot be accomplished by the direct support maintenance activity. The quantity of equipment authorized to be on hand for this purpose is established by the command concerned. Authorization for maintenance float are established only for certain items of equipment; and for some types, such as medical equipment, there is no requirement. Guidance for establishing maintenance float requirements is published in appropriate Department of the Army supply bulletins.

b. The following table gives the maintenance float authorizations recommended for selected types of equipment in direct support maintenance units and activities. The factors given are percentages of the total equipment supported by the maintenance activity and are subject to modification by the command concerned, depending upon location, activity, and the supply situation.

	1	2
1	Item or type of equipment	Maintenance float (percentage)
	<i>Chemical</i>	
2	Breathing apparatus, compressed air, ABC-M15A1 or M15.	10.0
3	Breathing apparatus, oxygen generating, M20.	10.0
4	Compressor, reciprocating, power-driven, 7 cfm, M1, M1A1, or AN-M4.	10.0
5	Decontaminating apparatus, power-driven, truck-mounted, M3A3 or M9.	10.0
6	Filter unit, gas-particulate, electric motor driven or gasoline engine driven, 300 cfm, ABC-M6.	5.0
7	Filter unit, gas-particulate, hospital, six-man, 12 cfm, ABC-M7A1 or M7.	5.0
8	Filter unit, gas-particulate, tank, three-man, 12 cfm, ABC-M8A2.	10.0
9	Filter unit, gas-particulate, tank, four-man, 12 cfm, M8A3.	10.0
10	Filter unit, gas-particulate, tank, five-man, 20 cfm, M13A1 or M13.	10.0
11	Flamethrower, portable, ABC-M9-7 or M2A1.	15.0
12	Generator, smoke, mechanical, pulse-jet, ABC-M3A3.	36.0
13	Heater, water, oil, skid-mounted, 600 gph, M2.	10.0
14	Heater, Water, oil, M1 -----	10.0
15	Disperser, riot control agent, portable, M3.	15.0
16	Disperser, riot control agent, helicopter or vehicle-mounted, M4.	15.0
17	Mask, protective, field, M17 or M9A1.	3.5
18	Mask, protective, field, M6-12-8, for dogs.	10.0
19	Mask, protective, tank, ABC-M14A2, ABC-M14A1, or M14.	5.0
20	Mask, gas, acid and organic vapors, M10.	10.0
21	Mask, gas, all-purpose, M11A1 ----	10.0
22	Mask, gas, ammonia, M12 -----	10.0
23	Service unit, flamethrower, truck mounted, M14A1 or M4.	30.0
	<i>Engineer</i>	
24	Boat, brg erection, 27-ft, gas-eng driven.	10.0
25	Compressor, trk-mtd, 210 CFM, gas-eng driven.	10.0
26	Crane-shovel, trk-mtd, 20-ton, $\frac{1}{2}$ cu yd.	10.0

	1	2
1	Item or type of equipment	Maintenance float (percentage)
27	Genr set, ptbl, gas-eng driven, 0.5-10 kw.	5.0
28	Genr set, diesel-eng driven, 15-30 kw.	10.0
29	Genr set, diesel-eng driven, 60-kw	5.0
30	Grader, road, mtz, diesel-eng driven.	10.0
31	Loader, scoop-type, diesel-eng driven, 4-wheel, 2½ cu yd.	5.0
32	Outboard motors (all)	5.0
33	Saw, chain, gas-eng driven (all)	10.0
34	Tractor, full-tracked, diesel-eng driven, lt	5.0
35	Tractor, full-tracked, diesel-eng driven, med.	15.0
36	Tractor, full-tracked, diesel-eng driven, hv.	15.0
	<i>Ordnance</i>	
	Combat-type vehicles:	
37	Carrier, cgo amph	4.0
38	Carrier, pers, full-tracked, armd	9.0
39	Gun, twin 40-mm, SP, full-tracked.	9.0
40	Gun, 90-mm, SP full-tracked	6.0
41	Howitzer, 105-mm, SP, full-tracked.	6.0
42	Howitzer, 155-mm, SP, full-tracked.	6.0
43	Howitzer, 8-in., SP, full-tracked	5.0
44	Mortar, 4.2-in., SP, full-tracked	9.0
45	Tanks (all models)	9.0
46	Tractor, full-tracked, high-speed	8.0
47	Tk recovery vehicles	8.0
	Transport-type vehicles:	
48	General purpose, motor-powered	10.0
49	Special purpose, motor-powered	3.0
50	Special eqp (ord less loads)	5.0
51	Tlr and stlr	3.0
	Fire control materiel:	
52	Fire con sys, air def, M33	10.0
53	Sighting and fire con eqp	2.0
54	Watches	20.0
	Automatic weapons, air defense and towed artillery:	
55	Gun, 280-mm, hv mtz	17.0
56	Trk, gun-lifting, hv, M249 (front), M250 (rear).	35.0
57	Convl-type air def wpn (all)	3.0
58	Towed arty	3.0
59	AW (less hand and shoulder)	3.0
60	Small arms (hand and shoulder) ¹ .	---

¹ Battlefield recovery will meet replacement requirements.

c. Criteria for direct exchange replacement are expressed in the number of days an un-serviceable item may remain in a maintenance facility without being repaired until it will be exchanged and replaced by a like item from the maintenance float stock of the maintenance facility. These criteria are established and modified as necessary by policy of the Department of the Army and commands concerned, with recommendations and guidance from the technical services. *For example*, the following general policy is used for the establishment, stockage, and operation of direct exchange of repair parts and assemblies for major items of ordnance equipment:

- (1) Items which have a high mortality rate and are reparable by cleaning, adjusting, or by use of repair kits may be placed on a direct exchange basis with using units.
- (2) When a new operation is begun or a new item is added to the direct exchange list, 25 percent of the authorized unit stockage will be used. This percentage factor may be increased or decreased as the activity or demands dictate. At no time should an excess of 75 percent of unit stockage be placed in the direct exchange section.
- (3) Direct exchange activities must be reviewed each 30 days to effect adjustment to stockage. As demands decrease, the stockage should also decrease. Seasonal fluctuations in the demand for some items will affect direct exchange stockage; i.e., cause the direct exchange section to be overstocked or understocked. The 75 to 25 percent remaining stockage in the technical supply section will be a buffer to replace items salvaged by the repair shop and deadlines caused by insufficient serviceable items in the direct exchange section.
- (4) The following data should be used as a guide for effecting maintenance float exchange of items of ordnance equipment other than guided missiles and heavy rockets:

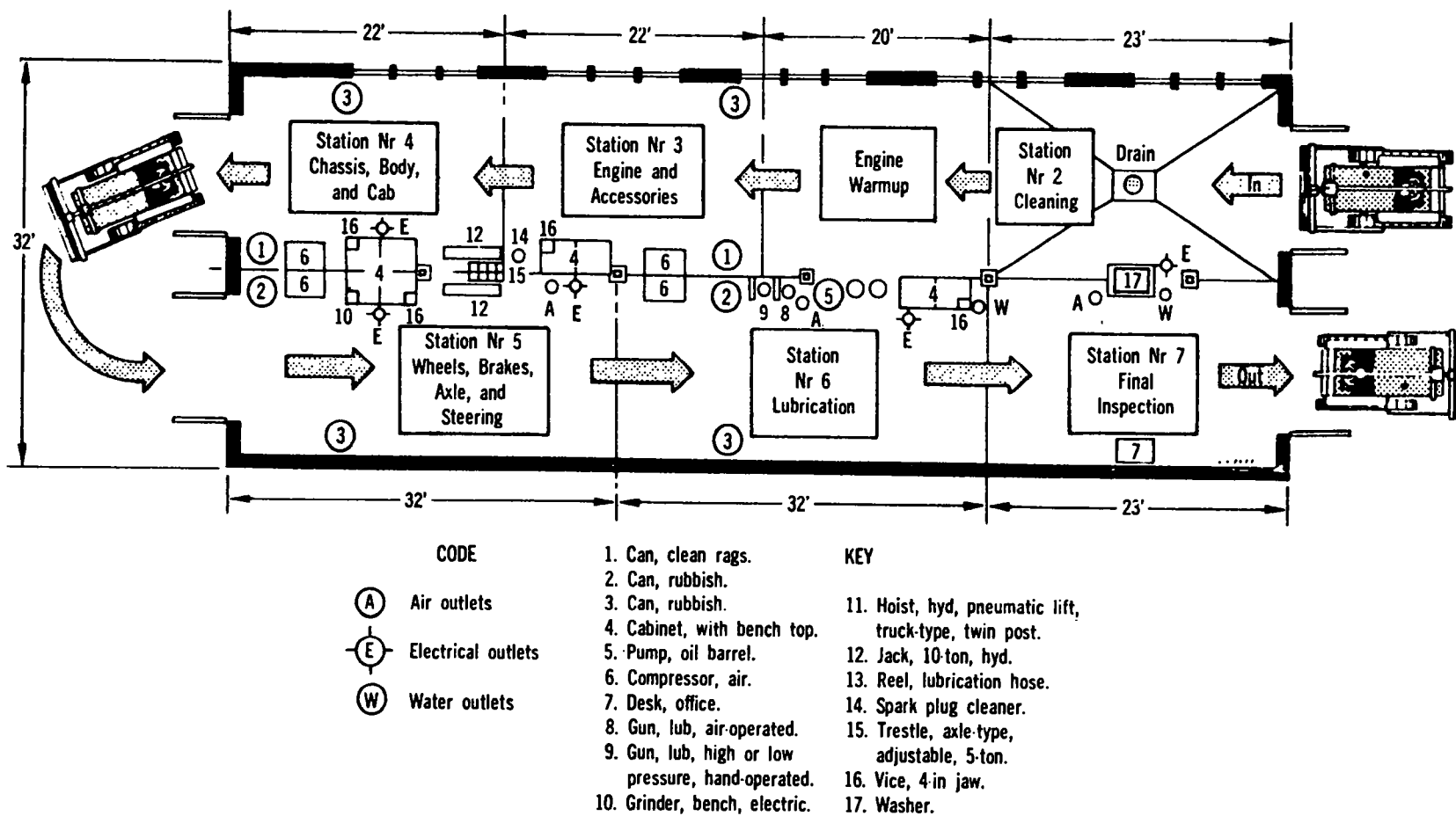


Figure 8-2

1	1	2
	Type of equipment	Down time (days)
2	Combat-type vehicles -----	14
3	Transport-type vehicles -----	5
4	Fire control materiel -----	3
5	Automatic weapons, air defense and towed artillery. -----	3
6	Small arms -----	(Immediate exchange on all items)

8-18. Maintenance Facilities and Utilities Requirements

a. Maintenance shops range in size and scope from small-unit shops with organic maintenance responsibilities to large installations capable of complete overhaul and rebuilding of equipment. The size of the shop and the num-

ber of shop sections required are governed by the scope of maintenance activities and responsibilities, shop equipment authorized, and workload. Figure 8-2 is a sample layout for a single-line shop.

b. Most maintenance units are authorized sufficient equipment to provide for their own utilities requirements. In areas where organic power equipment may be supplemented or replaced by local sources of power, planning for adequate power and lighting becomes necessary. *For example*, it is estimated that 1 watt per square foot of shop floor area is required for adequate overhead illumination of shop areas. Additional power must be provided for operation of shop machines and equipment, heating, and other uses.

c. Covered shop space requirements for maintenance units are given in the following table:

1	1	2	3	4
	TOE	Unit	Space allowances* (sq ft area)	Overhead clearance (ft)
		<i>Chemical</i>		
2	3-47E	Cml maint co -----	4,600	12
3	3-500E	Cml maint det (team EA) -----	900	12
4	3-500E	Cml maint det (team EB) -----	2,000	12
		<i>Medical</i>		
5	8-187D	Med dep, CommZ -----	1,150	10
6	8-667D	Army med dep -----	1,150	10
7	8-500C	Team GC, med eqp maint dep -----	530	10
8	8-500C	Team GD, med eqp maint det -----	750	10
9	8-500C	Team GE, med eqp maint det -----	950	10
		<i>Ordnance</i>		
10	9-7D	Ord DS co -----	9,800	15
11	9-9D	Ord GS co -----	6,825	15
12	9-127D	Ord dir autmv spt co -----	7,000	15
13	9-167D	Ord coll and clas co -----	6,300	15
14	9-197D	Ord gen autmv spt co -----	10,500	15
		<i>Quartermaster</i>		
15	10-337E	QM air eqp spt co abn div -----	108,000	14
16	10-349D	QM eqp maint co -----	86,150	14
17	10-407D	QM aerial sup co -----	120,000	14
18	10-417D	QM air eqp rep and dep co -----	32,440	14
19	10-500D	Team EA aerial sup det -----	40,000	14
20	10-500D	Team EC prcht and textile rep det -----	20,000	14
21	10-500D	Team ED platform rep det -----	5,000	14

	1	2	3	4
1	TOE	Unit	Space allowances * (sq ft area)	Overhead clearance (ft)
22	10-500D	Team EF prcht packing and maint det -----	5,000	14
23	10-500D	Team EG special forces prcht rigging det -----	5,000	14
24	10-500D	Team HA fabric and lthr rep det -----	2,500	14
25	10-500D	Team HB fabric and lthr rep det -----	5,000	14
26	10-500D	(Team HC fabric and lthr rep det -----	7,500	14
27	10-500D	Team HD fabric and lthr rep det -----	10,000	14

* Does not include open storage space that the units will require to support their shop operations.

8-19. Vehicle Losses

general-purpose vehicles destroyed and evacuated, number per 1,000 of actual vehicle strength:

Estimated daily losses in combat divisions of

	1	2	3	4
1	General type of operations for the force as a whole	Destroyed	Required repair by unit main- tenance section ¹	Required direct support or depot maintenance
2	Infantry division in attack of fortified position -----	27	27	15
3	Infantry division in attack of deliberate organized position. -----	16	15	11
4	Infantry division in attack of hastily organized position. -----	10	10	9
5	Infantry division in covering, security force, retire- ment, or delaying action. -----	5	5	7
6	Infantry division in defense of position -----	9	7	7
7	Infantry division in inactive situation ² -----	3	2	6
8	Infantry division in pursuit -----	5	5	7
9	Infantry division in assault of hostile shore -----	27	30	20
10	Infantry division in reserve -----	Negl	² 2	¹ 1
11	Armored division in attack -----	16	15	11
12	Armored division in inactive situation ² -----	3	2	6
13	Armored division in pursuit or exploitation -----	5	8	10
14	Armored division in retirement or delaying action -----	5	5	7
15	Armored division in reserve -----	Negl	² 2	¹ 1

¹ These quantities are in addition to the number in unit maintenance section each day for scheduled servicing.

² Forces in contact, neither side attacking.

³ These figures do not apply during rehabilitation.

CHAPTER 9

LOGISTICS—MANAGEMENT

Section I. GENERAL

9-1. Introduction

This chapter summarizes the detailed data on logistical planning presented in previous chapters. This summary is presented in the form of general logistical planning factors that will be found useful to staff officers at higher levels. It should be noted that these factors apply to *average* conditions and situations.

They should be used only as a first approximation in logistical planning or as "rule of thumb" checks against the calculations of technical planners. Specific situations may require widely different factors.

9-2. Organizational Factors—Theater Slices

a. Division Slices.

	1	2	3	4	5	6
1	Composition of slice by assignment of troops		Percentage of slice		Composition of slice by location of troops	
	Assignment	Troops	Theater	Combat zone	Troops	Location
2	Basic division -----	13,960	32	43	20,000	Division area.
3	Corps and field army troops -----	18,540	43	57	12,500	Corps and field army rear areas.
4	Communications zone and theater overhead.	10,750	25	-----	10,750	Communications zone.
5	Total -----	43,250	100	100	43,250	

b. Airwing Slices.

	1	2	3	4	5
1	Composition of slice by assignment of troops		Percentage of slice		Composition of slice by location of troops.
2	Air Force combat organization -----	2,550	36	-----	Division area.
3	Miscellaneous Air Force support units -----	3,450	50	-----	Corps and field army rear areas.
4	Army communications zone troops ¹ -----	1,000	14	7,000	Communications zone.
5	Total -----	7,000	100	7,000	

¹ Army troops required within the theater because of the presence of Air Force elements, which are provided Army combat service support.

c. Figures on Slices. Detailed figures on slices appear in paragraphs 4-1 through 4-7.

Section II. LOGISTICAL FACTORS

9-3. Supply Factors

These factors are for use as broad initial planning factors. They do not include tonnages involved in buildup of theater reserves.

a. Maintenance, short tons per day, for each division slice plus two airwing slices.

b. Maintenance, Pounds per Man per Day.

	1	2	3	4	5
1	Item	Consumed per man in theater (Army plus AF)	Consumed by Army in theater, per Army man in theater	Consumed by Army in combat zone, per Army man in combat zone	Consumed by Army in division areas, per Army man in such areas
2	Bulk POL -----	31	10	10	5
3	Vehicles -----	1(-)	1(-)	1	1(+)
4	Dry cargo -----	46	39	31	31(-)
5	Total -----	78	50(-)	42	37

c. Initial Equipment Plus 30 Days' Maintenance.

	1	2	3
1	Item	Measurement tons per man in the theater (Army plus AF)	Short tons per man in the theater (Army plus AF)
2	Initial equipment -----	8.00	1.80
3	30 days' maintenance dry cargo -----	1.35	0.75
4	30 days' maintenance bulk POL -----	¹ 1.046	1.001
5	Total -----	10.396	3.551

¹ Bulk petroleum normally is not expressed in measurement tons. This figure is provided for the purpose of comparison with dry cargo. Bulk petroleum represents 90 percent of all petroleum shipped to the theater. The remaining 10 percent is shipped packaged and is included in dry cargo.

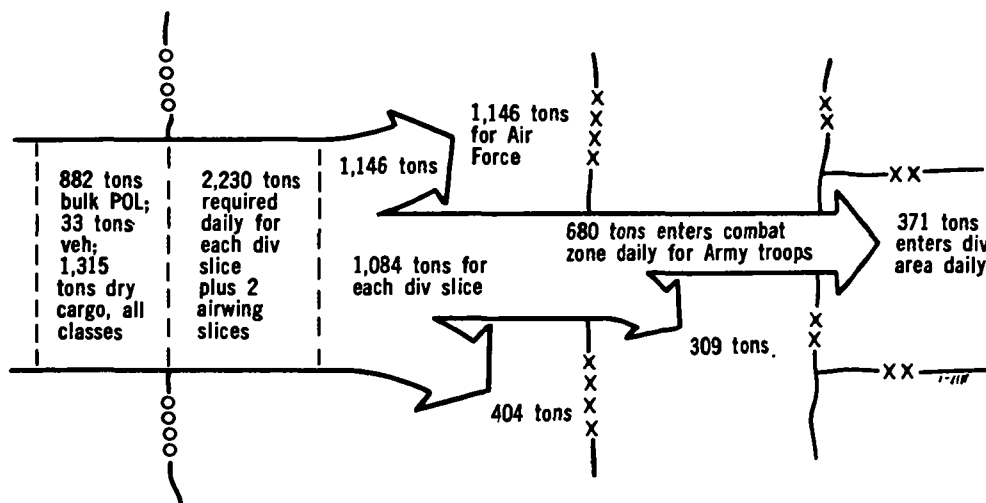


Figure 9-1

9-4. Evacuation and Hospitalization Factors

1		2
1	Kind of hospitalization	Quantity required ¹
2	Mobile hospitals:	
3	Evac, smbl -----	1 per div. and 2 per corps.
4	Mbl army surg -----	1 per div.
4	Fixed-hospital beds in the theater of operations -----	7 percent of theater of operations strength.

¹ These factors are valid only for conventional warfare operations. For factors applicable to nuclear warfare, see FM 101-10-8, chapter 2.

9-5. Transportation Factors

a. Capacities of Transportation Mediums.

1		2	3	4	5
1	Medium	Short tons per day	Long tons per day	Adequate to maintain	
2	Highways (average)	Gravel -----	3,400		2 divisions.
3		Bituminous treated -----	5,800		Corps of 4 divisions.
4		Concrete -----	8,400		Field army of 8-12 divisions.
5	Railways each way	Single-track -----	4,000	3,570	2 corps totaling 5-8 divisions.
6		Double-track -----	12,000	10,700	Field army of 12-18 divisions.
7	Pipeline	4-in. (inside diameter) -----	910	810	1 corps of 4 divisions.
8		6-in. -----	2,000	1,800	2 corps of 8 divisions.
9		8-in. -----	3,480	3,100	1 type field army.
10		12-in. -----	18,300	16,430	5 type field armies.
11	Discharge rate -----	Average cargo ship -----	720	633	
12	Across beaches -----	Per 1,000 yards of beach -----	1,680	1,500	
13	Capacities of average cargo ship -----		10,000 measurement tons of 5,000 long tons of Army cargo. ¹		
14	Capacities of average train in theater of operations		1,000 troops or 400 short tons of cargo.		

¹ See paragraph 7-47N.

b. Transportation Requirements of the Infantry Division.

1		2																		
1	Type	Requirement																		
2	Highway -----	5 trans light trk companies in addition to organic transport.																		
3	Air -----	Approximately 781 C-130 type aircraft sorties and 374 C-124 type aircraft sorties are required to air-land an infantry division. This is a lift of approximately 18,000 tons. For detailed data, see FM 7-100.																		
4	Amphibious operation.	Average strength of an <i>assault division</i> , including shore party and other attached and supporting elements, is 25,000 men with 5,000 vehicles. If 75 percent of the vehicles of the infantry division and attached and supporting elements are loaded out with the division in assault shipping, the requirements in assault shipping for a reinforced division in an amphibious operation are:																		
		<table> <tr> <th>Type</th><th>Extended voyage (10 days)</th><th>Short voyage (2-3 days)</th></tr> <tr> <td>APA (auxiliary transport, attack) -----</td><td>10</td><td>1</td></tr> <tr> <td>AKA (cargo ship, attack) -----</td><td>2</td><td>2</td></tr> <tr> <td>LST (landing ship, tank) -----</td><td>25</td><td>50</td></tr> <tr> <td>LSD (landing ship, dock) -----</td><td>7</td><td>7</td></tr> <tr> <td>LPH (landing platform, helicopter) -----</td><td>6</td><td>6</td></tr> </table>	Type	Extended voyage (10 days)	Short voyage (2-3 days)	APA (auxiliary transport, attack) -----	10	1	AKA (cargo ship, attack) -----	2	2	LST (landing ship, tank) -----	25	50	LSD (landing ship, dock) -----	7	7	LPH (landing platform, helicopter) -----	6	6
Type	Extended voyage (10 days)	Short voyage (2-3 days)																		
APA (auxiliary transport, attack) -----	10	1																		
AKA (cargo ship, attack) -----	2	2																		
LST (landing ship, tank) -----	25	50																		
LSD (landing ship, dock) -----	7	7																		
LPH (landing platform, helicopter) -----	6	6																		

9-6. Service Factors

a. Service Troop Factors. Service troops equal approximately 40 percent of division slice; 60 percent of service units are in communications zone, 40 percent in combat zone.

b. Equipment Factors. One vehicle for five to six men in a balanced force.

9-7. Legal Services

Past experiences indicate the following workloads may be expected in oversea theaters in times of hostilities:

a. Workload Per 10,000 Men.

	1	2	3	4	5
1	Area of responsibility	GCM's/mo	Claims/mo	War crimes incidents/mo	Legal assistance matters/mo
2	Combat zone -----	¹ 6	² 25	⁴ 15	30-50
3	Communications zone -----	¹ 9	³ 150	⁴ 10	100-150

¹ The incidence of general courts-martial may vary as much as 100 percent above the average stated without being considered abnormal.

² Past experience in oversea theaters in times of hostilities indicates that for each general courts-martial case there were also 7.7 special courts-martial and 12.7 summary courts-martial. It is anticipated that in any future wartime operations, the increased powers of a commander under the amended ARTICLE 15, UCMJ, will result in fewer summary courts-martial.

³ The rate of claims resulting from the presence of a given number of troops in a theater will depend on whether the area is industrialized or rural and on the population density of the area. These rates are appropriate for planning operations in Europe.

⁴ Although the enemy troop strength would be the source of the war crimes, for planning purposes our strength may be assumed to vary as the enemy strength varies.

b. Judge Advocate General Corps Teams to augment organic judge advocate sections (TOE 27-500). These teams may be employed when needed.

	1	2
1	Unit	Work unit/month
2	JAGC claims svc team FA -----	75-100 claims
3	JAGC claims svc team FC -----	25-75 claims
4	JAGC war crimes team GA -----	10-15 incidents
5	JAGC GCM trial team HA -----	10-15 GCM ¹
6	JAGC GCM trial team HB -----	20-25 GCM ²
7	JAGC legal asst team IA -----	100-150 cases
8	JAGC procurement law teams ³ -----	-----
9	JAGC control teams ⁴ -----	-----

¹ For capabilities, assignment, strength, basis of allocations, etc., of the teams listed in this table, see FM 101-10-2.

² This figure comprehends trial only, administrative details being handled by organic staff sections.

³ Team JA (contract law), team JB (property law), team JC (frauds), team JD (labor relations) and team JE (fiscal law).

⁴ Teams AA and AB (Headquarters), team FB (claims service), team GB (war crimes), team IB (legal assistance). In addition to control functions these teams are capable of performing legal functions as well.

CHAPTER 10 MISCELLANEOUS

Section I. CONVERSION FACTORS

10-1. Weight

	1	2	3	4	5	6
1	Unit	Long tons	Metric tons	Short tons	Kilograms	Pounds
2	1 long ton = -----		1.0160	1.1200	1,016.0	2,240.0
3	1 metric ton = -----	0.9842		1.1023	1,000.0	2,204.6
4	1 short ton = -----	0.8929	0.9072		907.2	2,000.0
5	1 kilogram = -----					2.2046

10-2. Speed

	1	2	3	4	5	6	7	8
1	Unit	Knots	Status miles per hour	Kilometers per hour	Feet per minute	Feet per second	Meters per minute	Meters per second
2	1 knot * = -----		1.1516	1.8532	101.34	1.6890	30.89	0.5148
3	1 mile per hr = -----	0.8684		1.6093	88.00	1.4667	26.82	0.4470
4	1 km per hr = -----	0.5396	0.6214		54.68	0.9113	16.67	0.2778

* One knot—nautical mile per hour.

10-3. Power

	1	2	3	4	5	6
1	Unit	Kilowatts	Horsepower	Btu * per min	Ft lb per sec	Ft lb per min
2	1 kilowatt = -----		1.34100	56.88	737.600	44,250.0
3	1 horsepower = -----	0.7457		42.42	550.000	33,000.0
4	1 Btu * per min = -----	0.01758	0.02358		12.968	778.1

* Btu, or British thermal unit, is the quantity of heat required to raise the temperature of 1 pound of water 1°F.

10-4. Angular Conversions

	1	2	3	4	5
1	Unit	Radians	Degrees	Mils	Minutes
2	1 radian = -----		57.2958	1,018.600	
3	1 degree = -----	0.017453		17.778	60.000
4	1 mil = -----		0.05625		3.375

Note. $360^\circ = 2\pi$ radians = 6,400 mils.

10-5. Linear Measure

	1	2	3	4	5	6	7	8	9	10	11
1	Unit	Nautical miles	Statute miles	Kilometers	Cables lengths	Fathoms	Meters	Yards	Feet	Inches	Centimeters
2	1 nautical mile =		1.1516	1.8532	8.455	1,013.4	1,853.2	2,026.8	6,080.27	72,963.0	185,325.0
3	1 statute mile =	0.8684		1.6093	7.333	880.0	1,609.3	1,760.0	5,280.0	63,360.0	160,933.0
4	1 kilometer =	0.5396	0.6214		4.557	546.8	1,000.0	1,093.6	3,281.0	39,370.0	100,000.0
5	1 cable length =	0.1184	0.1364	0.2195		120.0	219.5	240.0	720.0	8,640.0	21,945.0
6	1 fathom =						1.829	2.0	6.0	72.0	182.88
7	1 meter =					0.5468		1.0936	3.281	39.37	100.0
8	1 yard =					0.5000	0.9144		3.0	36.0	91.44
9	1 foot =					0.1667	0.3048	0.3333		12.0	30.48
10	1 inch =								0.0833		2.54
11	1 centimeter =								0.0328	0.3937	

10-6. Surface

	1	2	3	4	5	6	7	8	9
1	Unit	Square miles	Square kilometers	Hectares	Acres	Square rods	Square meters	Square yards	Square feet
2	1 square mile =		2.59	259.0	640.0	102,400.0	2,589,945.0	3,097,600.0	
3	1 square kilometer =	0.3861		100.0	247.1	39,537.0	1,000,000.0	1,196,010.0	
4	1 hectare =		0.010		2.471	395.4	10,000.0	11,960.0	107,641.0
5	1 acre =			0.4047		160.0	4,047.0	4,840.0	43,560.0
6	1 square rod =						25.29	30.25	272.25
7	1 square meter =					0.03954		1.1960	10.764
8	1 square yard =					0.03306	0.8361		9.000

10-7. Volume

	1	2	3	4	5	6
1	Unit	Cubic Feet	Imperial gallons	U. S. gallons	Liters	Quarts
2	1 cubic foot =		6.229	7.481	28.32	29.92
3	1 imperial gallon =	0.16054		1.2010	4.546	4.804
4	1 U. S. gallon =	0.13368	0.8327		3.785	4.000
5	1 liter =	0.03532	0.2201	0.2642		1.0567
6	1 measurement ton =	40.0				
7	1 barrel (petroleum) =	5.61		42.0		

Section II. PHYSICAL CONSTANTS

10-8. Speed of Sound

	1	2	3	4	5	6	7	8
1	Unit	In air (at degrees F.)					In water	
		10°	0°	30°	70°	100°	Fresh	Salt
2	Feet per sec = -----	1,039	1,050	1,083	1,127	1,171	4,700	4,752
3	Miles per hr = -----	708	716	738	768	797	3,205	3,246

10-9. Speed of Light

The speed of light is approximately 186,000 miles per second.

10-10. Acceleration Due to Gravity

Acceleration due to gravity is 32.2 feet per second.

10-11. Atmospheric Pressure

Atmospheric pressure is 14.7 pounds per square inch. This is equal to the pressure ex-

erted by a column of water 33.9 feet high, which is the theoretical maximum height to which water may be drawn by suction.

10-12. Circumference of the Earth at the Equator

The circumference of the earth at the equator is 24,902 miles.

10-13. Time Between Moons

Time between moons is 29 days, 12 hours, 44 minutes.



APPENDIX

REFERENCES

FM 1-5	Army Aviation Organization and Employment
FM 1-10	Army Aviation Organizational Aircraft Maintenance
FM 1-15	Aviation Battalion
FM 1-100	Army Aviation
FM 3-5	Chemical, Biological, and Radiological (CBR) Operation
FM 3-8	Chemical Corps Reference Handbook
FM 3-10	Chemical and Biological Weapons Employment
FM 3-85	Chemical Service Units
FM 5-15	Field Fortifications
FM 5-22	Camouflage Materials
FM 5-25	Explosives and Demolitions
(S) FM 5-26	Employment of Atomic Demolition Munition (ADM) (U)
FM 5-30	Engineer Intelligence
FM 5-35	Engineers' Reference and Logistical Data
FM 5-36	Route Reconnaissance and Classification
FM 6-20-1	Field Artillery Tactics
FM 6-20-2	Field Artillery Techniques
(C) FM 6-37	Field Artillery Missile Battalion, SERGEANT (U)
FM 6-39	Field Artillery Battalion (PERSHING) (U)
FM 6-56	Field Artillery Missile Battalion (Battery), LITTLE JOHN Rocket
FM 6-61	Field Artillery Missile Battalion, HONEST JOHN Rocket, Self-propelled
FM 7-24	Communications in Infantry and Airborne Divisions
FM 7-30	Infantry, Airborne, and Mechanized Division Brigades
FM 8-15	Division Medical Service, Infantry, Airborne, Mechanized, and Armored Divisions
FM 8-55	Army Medical Service Planning Guide
FM 9-1	Ordnance Service in the Field
FM 9-2	Ordnance Corps Logistical Data
(S) FM 9-2A	Ordnance Corps Logistical Data (Classified Data) (U)
FM 9-6	Ammunition Service in the Theater of Operations
FM 10-8	Air Delivery of Supplies and Equipment in the Field Army
FM 10-13	Quartermaster Reference Data
FM 10-20	Organization for Supply of Petroleum Products in Theaters of Operations
FM 10-50	Supply and Transport Battalion, Division Support Command
FM 10-60	Supply of Subsistence in a Theater of Operations
FM 10-64	Quartermaster Class II and IV Supply in Theaters of Operations
FM 11-20	Signal Operations, Theater of Operations
FM 11-40	Signal Corps Pictorial Operations
FM 11-50	Signal Battalion Armored, Mechanized, and Infantry Divisions
FM 11-57	Signal Battalion Airborne Division

FM 101-10-1

FM 11-95	Army Signal Battalion
FM 16-5	The Chaplain
FM 17-1	Armor Operations
FM 17-30	The Armored Division Brigade
FM 17-36	Divisional Armored and Air Cavalry Units
FM 17-95	The Armored Cavalry Regiment
FM 19-25	Military Police Traffic Control
FM 19-40	Enemy Prisoners of War and Civilian Internees
FM 20-32	Land Mine Warfare
FM 20-33	Combat Flame Operations
FM 20-60	Battlefield Illumination
FM 21-5	Military Training Management
FM 21-6	Techniques of Military Instruction
FM 21-26	Map Reading
FM 21-30	Military Symbols
FM 24-1	Tactical Communications Doctrine
FM 24-18	Field Radio Techniques
FM 24-19	Communications-Electronics Reference Data
FM 24-20	Field Wire and Field Cable Techniques
FM 30-5	Combat Intelligence
FM 30-9	Military Intelligence Battalion, Field Army
FM 30-10	Terrain Intelligence
(C)FM 30-10A	Special Applications of Terrain Intelligence (U)
FM 30-16	Technical Intelligence
FM 31-10	Barriers and Denial Operations
FM 31-11	Doctrine for Amphibious Operations
FM 31-12	Army Forces in Amphibious Operations (The Landing Force).
FM 33-1	Psychological Operations U.S. Army Doctrine
FM 38-1	Logistics Supply Management
FM 38-2-1	Logistics Materiel Management—Requirements
FM 41-10	Civil Affairs Operations
FM 44-1	U.S. Army Air Defense Employment
(S)FM 44-1A	U.S. Army Air Defense Employment (U)
FM 55-4	Transportation Movements in Theaters of Operations
FM 55-6	Transportation Services in Theaters of Operations
FM 55-8	Transportation Intelligence
FM 55-15	Transportation Reference Data
FM 55-21	Transportation Railway Supervisory Units
FM 55-22	Transportation Railway Battalions
FM 55-35	Motor Transport Operations and Motor Transport Units
FM 55-45	Aircraft Maintenance Services and Units in Field Army
FM 55-51	Transportation Terminal Commands Theater of Operations
FM 55-57	Transportation Harbor Craft Units and Marine Maintenance Units
FM 55-58	Transportation Boat Operations
FM 57-35	Airmobile Operations
FM 57-100	The Airborne Division
FM 60-30	Embarkation and Loading—Amphibious
FM 61-100	The Division
FM 100-5	Field Service Regulations—Operations
FM 100-10	Field Service Regulations—Administration

FM 100-15	Field Service Regulations, Larger Units
(C)FM 100-20	Field Service Regulations—Counter insurgency (U)
FM 101-5	Staff Officers' Field Manual; Staff Organization and Procedures
FM 101-10-2	Staff Officers' Field Manual; Organization, Technical, and Logistical Data; Extracts of Tables of Organization and Equipment
(S)FM 101-10-3	Staff Officers' Field Manual; Organization, Technical, and Logistical Data; Classified Data (U)
FM 105-5	Maneuver Control
TM 3-200	Capabilities and Employment of Toxic Chemicals
TM 3-220	Chemical, Biological, and Radiological (CBR) Decontamination
TM 3-250	Storage, Shipment, and Handling of Chemical Agents and Hazardous Chemicals
TM 3-500	Chemical Corps Equipment Data Sheets
TM 5-210	Military Floating Bridge Equipment
TM 5-231	Mapping Functions of the Corps of Engineers
TM 5-236-series	The American Ephemeris and Nautical Almanac (Current Year)
TM 5-240	Map Compilation, Color Separation, and Revision
TM 5-243	Cartographic Aerial Photography
TM 5-245	Map Reproduction
TM 5-248	Foreign Maps
TM 5-277	Panel Bridge, Bailey Type, M2
TM 5-285	Semipermanent Highway Steel Bridges, 30-, 60-, and 90-foot Spans
TM 5-286	Semipermanent Highway and Railway Trestle Bridges
TM 5-301	Staff Tables of Engineer Functional Components System
TM 5-302	Construction in the Theater of Operations
TM 5-303	Bills of Materials and Equipment of the Engineer Functional Components System
TM 5-311	Military Protective Construction (Nuclear Warfare and Chemical and Biological Operations)
TM 5-312	Military Fixed Bridges
TM 5-330	Planning, Site Selection, and Design of Roads, Airfields, and Heliports in the Theater of Operations
TM 5-360	Port Construction and Rehabilitation
TM 5-370	Railroad Construction
TM 5-372	Unit Construction Railway Bridge
TM 5-374	Light Standard and Standard Unit Steel Trestles
TM 5-700	Field Water Supply
TM 9-500	Data Sheets for Ordnance Type Materiel
TM 9-1300-206	Care, Handling, Preservation, and Destruction of Ammunition
TM 9-1345-200	Land Mines
TM 9-1900	Ammunition, General
TM 9-2800	Military Vehicles
TM 10-500	Air Delivery of Supplies and Equipment: General
TM 10-1100-series	Petroleum Pipeline and Terminal Operating Procedures and Techniques (as appropriate)
TM 10-1619	Quartermaster Materials Handling Equipment
TM 30-245	Photographic Interpretation Handbook
TM 30-246	Tactical Interpretation of Air Photos
TM 38-750	Army Equipment Record Procedures
TM 38-750-1	Maintenance Management: Field Command Procedures

TM 57-210	Air Movement of Troops and Equipment
TM 743-200	Storage and Materials Handling
TM 743-200-1	Storage and Materials Handling
TB AVN 2	Engine and Transmission Oils, Fuels, and Additives for Army Aircraft
AR 10-5	Department of the Army
AR 10-7	United States Continental Army Command
AR 10-11	United States Army Materiel Command
AR 10-12	United States Army Combat Developments Command
AR 10-13	United States Army Strategic Communications Command
AR 11-8	Logistics Policy
AR 55-10	Military Standard Transportation and Movement Procedures (MIL-STAMP)
AR 55-21	General Passenger Traffic Procedures Applicable to Procurement of Transportation Accommodations
AR 55-355	Military Traffic Management Regulation
AR 117-5	Military Mapping and Geodesy
AR 210-21	Training Areas and Facilities for Ground Troops
AR 220-10	Preparation for Oversea Movement of Units (POM)
AR 230-5	General Policies
AR 310-3	Department of the Army Publications—Preparation, Coordination, and Approval
AR 310-32	Organization and Equipment Authorization Tables; Personnel
AR 320-5	Dictionary of United States Army Terms (Short Title: AD)
AR 320-50	Authorized Abbreviations and Brevity Codes
AR 330-10	Data Processing Units
AR 385-63	Regulations for Firing Ammunition for Training, Target Practice, and Combat
AR 612-35	Preparation of Replacements for Oversea Movement (POR)
AR 700-12	Control, Supply, and Positioning of Materiel
AR 700-26	Designating, Redesignating, and Naming Military Aircraft
AR 700-33	Cargo Utilization
AR 725-50	Requisitioning, Receipt, and Issue System
AR 740-12	Covered and Open Storage of Supplies
AR 750-1	Maintenance Concepts
AR 750-4	Major Overhaul Policy and Program for Oversea Commands
AR 750-5	Organization, Policies, and Responsibilities for Maintenance Operation
DA Pam 310-1	Index of Administrative Publications (Army Regulations, Special Regulations, Pamphlets, Department of the Army Posters, Joint Chiefs of Staff Publications, General Orders, and Bulletins)
DA Pam 310-2	Index of Blank Forms
DA Pam 310-3	Index of Doctrinal, Training, and Organizational Publications (Field Manuals, Reserve Officers' Training Corps Manuals, Training Circulars, Army Training Programs, Army Subject Schedules, Army Training Tests, Firing Tables and Trajectory Charts, Tables of Organization and Equipment, Type Tables of Distribution, and Tables of Allowances).
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8 and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders
DA Pam 310-5	Index of Graphic Training Aids and Devices
DA Pam 310-6	Index of Supply Catalogs and Supply Manuals

DA Pam 310-8	Index of Army Personnel Tests and Measures
DA Pam 310-35	Index of International Standardization Agreements
SB 1-1	Army Aircraft Flying Hour Factors and Forecast
SB 3-34	Maintenance Float, CBR Equipment
SB 3-39	Basic Loads of Chemical Nontoxic Ammunition
SB 9-140	Field Maintenance Floats: Major Items of Equipment Authorized for Stockage in Both Peacetime and Wartime
SB 10-495	Standard "B" Ration for the Armed Forces
SB 10-496	Wartime Replacement Factors and Consumption Rates, Quartermaster Corps
(C)SB 38-26	Ammunition Supply Rates (U)
JANAP's	
JCS Pub 2	Unified Action Armed Forces (UNAAF)
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INDEX

	Paragraphs	Pages		Paragraphs	Pages
Accumulation factors, hospitalization	6-7e, 6-9b	6-5, 6-10	Estimates, personnel losses ..	2-5f	2-6
Adjutant general:			Troop requirements	4-4	4-25
Supplies	5-47	5-109	Aircraft:		
Units:			Airfield construction	8-12	8-24
Aircraft requirements,			Air Force transport:		
type field army	4-12b(4)(c)	4-75	Capacities	6-11, 7-43c	6-11, 7-48
Troop requirements,			Characteristics	7-43c	7-48
type field army	4-2e(15)	4-23	Glossary of terms	7-43b	7-48
Administrative loading	7-50b	7-54	Army:		
Admission rates to hospitals ..	6-2-6-5	6-1	Airlifting in Air Force		
Aerial delivery provisions	7-41c	7-41	transport	7-43e	7-48
Aerial photography	3-12-3-14	3-9	Capacities	6-11, 7-42b	6-11, 7-42
Aerial photo(s):			Characteristics	7-42b-d	7-42
Coverage, types	3-12b	3-10	Class III supply data	7-42b	7-42
Requirements	3-13	3-10	Fixed-wing	7-42a, b, d	7-41,
Reproduction and photo-			7-42, 7-46		
interpretation units	3-14	3-12	Rotary-wing	7-42a-c	7-41
Types	3-12a	3-9	Requirements:		
Aerial port squadrons	7-9c(2)	7-18	Airborne division	4-12a	4-56
Aeronautical charts, require-			Field army	4-12b	4-56
ments	3-5b(1)(d),	3-3	Infantry division	4-12a, 4-56, 4-58	
	(2)		4-12b(4)(a)		
Airborne division (<i>See also</i>			Nondivisional units,		
Division.):			type field army	4-12b(4)(b)	4-59
Aircraft requirements	4-12a	4-56	Air defense:		
Class III supply data	5-17	5-35	Artillery (<i>See also</i>		
Class V supply data	5-34	5-53	Artillery.):		
Estimates:			Basic loads	5-38a(1)	5-77
Class V supply expend-			Class III supply data ..	5-21a	5-43
iture, daily	5-32b	5-51	Units:		
Personnel losses	2-5d, f	2-4, 2-6	Aircraft require-		
Prisoner of war capture			ments, type field		
rates	2-10a	2-21	army	4-12b(4)(b)	4-59
Headquarters, internal			Troop requirements,		
arrangement	2-18, 2-21	2-24, 2-29	type field army ..	4-2e(3)(a)	4-6
Maintenance planning data ..	8-14-8-19	8-29	Weapons,		
Maps and aerial photos:			characteristics	4-17c(1)	4-87
Distribution	3-8	3-5	Commands, organization ..	1-2b	1-1
Functions	3-3	3-1	Airfield(s):		
Requirements	3-5, 3-13	3-2, 3-10	Capabilities	7-9d	7-18
Responsibility	3-3	3-1	Construction	8-12	8-24
Organization	1-9	1-12	Air Force:		
Slice	4-6, 4-7a, 4-26, 4-30,	5-53, 9-2a	Admission rates to		
			hospital	6-5b	6-4
Supply requirements in air-			Airfields, construction	8-12a	8-24
borne assault	5-57	5-112	Air terminal responsibilities ..	7-9b, c	7-17
Training	4-14, 4-15	4-82, 4-83	Photographic units	3-14b	3-12
Troop requirements, type			Transport aircraft	7-43	7-48
field army	4-2d	4-4	Units, troop requirements,		
Vehicles and equipment	1-11	1-14	type shore party	4-5	4-26
Weapons	1-10	1-13	Wing slice	4-6, 4-7b, 4-26, 4-30,	5-53, 9-2b
Airborne operations:					5-111, 9-1
Aircraft requirements	4-12b	4-56	Air movement (<i>See also</i>		
			Movement.)	4-12	4-56

FM 101-10-1

	Paragraphs	Pages		Paragraphs	Pages
Air terminals -----	7-9	7-17	Rail movement -----	7-31g	7-35
Air transportation -----	7-40-7-43	7-41	Road spaces and time		
Airborne division -----	4-12a	4-56	lengths -----	4-10b-e	4-38
Infantry division -----	4-12a	4-56	Slice -----	4-6, 4-7a, 4-26, 4-30, 5-53, 9-2a	5-111, 9-1
Ambulance:			Supply requirements -----	5-57	5-109
Capacities -----	6-11	6-11	Training -----	4-14, 4-15	4-82, 4-83
Evacuation, time factors -----	6-12	6-12	Troop requirements, type		
Ammunition (<i>See also</i> Basic load and Class V supply.):			field army -----	4-2d	4-4
Basic data -----	5-25	5-48	Vehicles and equipment -----	1-17	1-22
Chemical -----	4-18, 5-40	4-91, 5-93	Losses, vehicle -----	8-19	8-46
Combat vehicle -----	5-31	5-49	Weapons -----	1-16	1-21
Day of supply:			Armored units, nondivisional:		
Supply levels -----	5-27	5-48	Aircraft requirements,		
Supply system,			type field army -----	4-12b(4)(b)	4-59
conventional -----	5-28	5-49	Class III supply data -----	5-20	5-42
Supply system, special -----	5-30	5-49	Class V supply data -----	5-35	5-58
Expenditures -----	5-32, 5-33	5-50, 5-52	Troop requirements, type		
Supply -----	5-25, 5-45	5-48, 5-106	field army -----	4-2e(1)	4-4
U. S. Army Security			Army:		
Agency units -----	5-43	5-103	Aircraft (<i>See also</i> Aircraft.) -----	7-43	7-48
Amphibious operations -----	4-13b, c	4-77, 4-81	Air defense commands		
Assault:			(map) -----	1-2b	1-1
Shipping, division -----	4-13b(3) (d), 7-4b	4-80, 7-2	Air terminal responsibilities -----	7-9b(2), c	7-17
Transportation requirements of infantry division -----	9-5b	9-8	Areas (map) -----	1-2a	1-1
Base development, logistical requirements -----	8-3c	8-1	Aviation units:		
Beaches -----	4-13b, 7-7a	4-77, 7-9	Aircraft requirements,		
Personnel losses, estimates -----	2-5g	2-7	type field army -----	4-12b(4)(b)	4-59
Ships and craft,			Troop requirements,		
characteristics -----	7-7a(3)	7-9	type field army -----	4-2e(2)	4-4
Supplies, movement -----	7-4d	7-2	Exchange supplies -----	5-48	5-110
Troop requirements -----	4-5	4-26	Field. (<i>See</i> Field army.)		
Vehicles -----	7-7a(3)(d)	7-11	Group, organization -----	1-4	1-1
Anchorage areas -----	7-6e	7-6	Missile commands -----	1-26, 1-27	1-38
Animals, pack -----	7-56	7-65	Security Agency units. (<i>See</i> U.S. Army Security Agency units.)		
Armored division (<i>See also</i> Division.):			Theater, organization -----	1-3	1-1
Class III supply data -----	5-18	5-37	Artillery:		
Class V supply data -----	5-35	5-58	Class III supply data -----	5-21	5-43
Estimates:			Class V supply data -----	5-38	5-77
Class V supply expenditure -----	5-32	5-50	Expenditures -----	5-32, 5-33	5-50, 5-52
Personnel losses -----	2-5d, e; 2-7a(2)	2-4, 2-5, 2-10	Troop requirements, type		
Prisoner-of-war capture rates -----	2-9, 2-10a	2-20, 2-21	field army -----	4-2e(3)	4-6
Headquarters, internal arrangement -----	2-18, 2-21	2-24, 2-29	Weapons, characteristics -----	4-17c	4-87
Maintenance planning data -----	8-14-8-19	8-29	Assemblages, medical service		
Maps and aerial photos:			unit -----	5-7	5-14
Distribution -----	3-8	3-5	Available supply rate -----	5-27	5-48
Functions -----	3-3	3-1	Barbed-wire obstacles -----	4-30b(4)	4-116
Requirements -----	3-5, 3-18	3-2, 3-10	Barges, requirements -----	7-46a	7-51
Responsibility -----	3-3	3-1	Base development -----	8-3	8-1
Motor move, time factors -----	4-10h	4-44	Basic load (<i>See also</i> Ammunition and Class V supply.):		
Organization -----	1-12	1-16	5-25, 5-48, 5-53, 5-34-5-45		5-106
			Airborne division -----	5-34	5-58
			Armored division -----	5-35	5-58
			Armored units, nondivisional -----	5-39	5-91
			Artillery units, non-divisional -----	5-38	5-77

	Paragraphs	Pages		Paragraphs	Pages
Chemical units -----	5-40	5-98	Pictorial -----	4-25b	4-109
Engineer units, non-			Pipelines -----	7-15	7-23
divisional -----	5-41	5-94	Truck unit, for operations --	7-11b(10)	7-20
Infantry division -----	5-36	5-70	Capacities:		
Military Police units,			Air Force transport		
nondivisional -----	5-44	5-105	aircraft -----	6-11, 7-43c	6-11, 7-48
Service units -----	5-45	5-106	Army aircraft -----	6-11, 7-42b	6-11, 7-42
Signal units, nondivisional --	5-42	5-94	Beach(es):		
U. S. Army Security Agency			Assault landing -----	4-13b(3)	4-80
units -----	5-43	5-103	Unloading -----	7-7a(1)--- (3), 7-7b(2)	7-9, 7-16
Battalion month, engineer con-			Highways, tonnage -----	9-5a	9-8
struction troops -----	8-4a, 8-12	8-2, 8-24	Ice, load-bearing -----	4-34	4-125
Beaches:			Inland waterways -----	7-45	7-51
Amphibious assault,			Lines of communications --	5-78	5-138
selection -----	4-13b, 7-7a(6)	4-77, 7-15	Nuclear powerplants -----	8-11	8-21
Capacities -----	7-7a(1), 7-7b	7-9, 7-15	Pipelines -----	7-4g, 7-14, 7-3, 7-23, 9-5a	9-3
Ship unloading, require-			Railways, foreign -----	7-34	7-36
ments -----	7-4c; 7-7a(3), (6)	7-2, 7-9, 7-15	Road -----	4-28c	4-110
Bearers, human -----	7-58	7-66	Telephone installations ---	8-13d-f	8-28
Bed requirements, hospital:			Tent camps -----	8-9j(1)(b)	8-17
Basic data -----	6-6, 6-7	6-4	Terminals:		
Computations -----	6-8	6-8	Inland -----	7-8b	7-16
CONUS -----	6-9	6-10	Water -----	7-6b, 7-7a(1)	7-4, 7-9
Billeting -----	8-9i(4)	8-18	Traffic -----	4-28a	4-110
Bivouac areas -----	8-9i(1)	8-16	Transportation:		
Boats -----	4-29, 5-11	4-111, 5-20	Mediums -----	9-5a	9-3
Assault -----	4-29b	4-112	Patients -----	6-11	6-11
Fuel -----	5-13e	5-27	Vehicle(s):		
Inland waterways, require-			Class V, resupply -----	5-38c	5-90
ments -----	7-46	7-46	Patients, for transporta-		
Bridge(s):			tion -----	6-11	6-11
Construction -----	8-5b, c, e	8-3, 8-4	Payload -----	7-11b(2), 7-19, 7-20 (10)	
Floating, characteristics --	4-29d	4-113	Personnel, on road		
Highway, fixed -----	4-29e, f, h	4-113, 4-115	movements -----	4-8g	4-35
Load capacity, civilian ---	4-28b	4-110	Vessels, cargo -----	7-4a, 7-52	7-2, 7-55
Marking -----	4-28c	4-110	Water equipment -----	5-46b-e	5-108
Railway bridging equipment	4-29g	4-113	Capture rates, prisoner of war --	2-8-2-10	2-19
Buildings, construction (<i>See also</i>			Cargo vessels. (<i>See</i> Vessels,		
Construction and Estimates.)-	8-9	8-11	cargo.)		
Capabilities:			Casualties, battle -----	6-4	6-2
Aerial photo reproduction			Admission rates -----	6-2-6-5	6-1
and photointerpretation			Airborne operations -----	2-5f	2-6
units -----	3-14	3-12	Amphibious operations -----	2-5g	2-7
Aerial port squadrons -----	7-9c(2)	7-18	Classification -----	6-1	6-1
Airfield -----	7-9d	7-18	Computations for hospital		
Air Force transport aircraft	7-43c	7-48	bed requirements -----	6-8	6-8
Animals, pack -----	7-56b	7-65	Distribution -----	2-5d(2)--- (5), e(3)---(6); 2-7a(2)	2-4, 2-6; 2-10
Engineer shore assault units	1-22b	1-30	Estimates -----	2-5, 6-1--- 6-5	2-3, 6-1
Highway tonnage -----	7-4f, 7-13	7-3, 7-22	Return to duty -----	2-7b(5)--- (7)	2-12
Lines of communications --	7-3	7-1	Theater -----	2-7	2-10
Logistical commands -----	1-8d(1)(b), (2)(b), (3)(b)	1-6, 1-9, 1-10	Loss rates, daily -----	2-5d(1)	2-4
Missile command, U. S.			Nuclear, biological, and		
Army -----	1-27b	1-38	chemical, hospital bed		
Special forces group,			requirements -----	6-8a	6-9
airborne -----	1-28	1-41			

	Paragraphs	Pages		Paragraphs	Pages
Chaplain planning factors -----	2-17	2-23	Requirements -----	5-53b, d; 5-52-5-62	5-113, 5-115, 5-111
Characteristics:			Storage area -----	5-64, 5-68	5-127, 5-131
Air Force transport aircraft	7-43c	7-48	Class III supply (<i>See also</i> Gasoline.) -----	5-13-5-24	5-24
Animals, pack -----	7-56b	7-65	Construction of storage and distribution facilities -----	8-10	8-19
Army aircraft -----	7-42b-d	7-42	Conversion factors -----	5-15	5-30
Assault boats -----	4-29b	4-112	Installations, combat zone --	5-79b	5-143
Bridging equipment, railway -----	4-29g	4-113	Requirements -----	5-16; 5-53b, e; 5-52-5-62	5-32, 5-113, 5-116; 5-111
Emplacements, weapons -----	4-30b	4-116	Storage area -----	5-64, 5-68	5-127, 5-131
Fixed bridges -----	4-29e, f	4-113	Class V supply (<i>See also</i> Ammu- nition and Basic load.) -----	5-25-5-45	5-48
Floating bridges -----	4-29d	4-113	Combat vehicles -----	5-31	5-49
Inland waterways -----	7-44b	7-51	Installations, combat zone --	5-79b	5-143
Rafts -----	4-29c	4-113	Requirements -----	4-18d; 5-53b, f; 5-52-5-62	4-101, 5-113, 5-118, 5-111
Railway bridging equipment	4-29g	4-113	Storage area -----	5-64, 5-68	5-127, 5-131
Rations -----	5-3	5-2	Close column -----	4-10b, c 4-38, 4-39	
Rolling stock -----	7-22	7-27	Combat loading -----	7-50a	7-54
Signal equipment -----	4-26	4-110	Combat zone:		
Telephone poles -----	8-13b	8-27	Estimates, personnel losses and replacements -----	2-5	2-3
Vessels:			Road net -----	8-5a(2)(a)	8-2
Amphibious -----	7-7a(4)	7-15	Signal communications -----	4-20a	4-102
Cargo -----	7-52	7-55	Slice -----	4-7a, 9-2a	4-30, 9-1
Weapons -----	4-17, 4-18 4-84, 4-91		Supply:		
Chemical:			Class V -----	5-25-5-30	5-48
Ammunition day of supply data -----	5-25b	5-48	Installations -----	5-79	5-141
Casualties, computing hospi- tal bed requirements -----	6-8c	6-9	Requirements -----	5-55	5-120
Equipment:			Command post(s) -----	2-19-2-21	2-25
Items -----	5-5	5-4	Corps:		
Maintenance:			Main -----	2-20a	2-27
Float authorizations	8-17b	8-42	Rear -----	2-20b	2-28
Time factors -----	8-15d	8-30	Division headquarters:		
Mines -----	4-18	4-91	Main -----	2-19a	2-25
Units:			Rear -----	2-19b	2-26
Aircraft requirements, type field army -----	4-12b(4)(b)	4-58	Field army:		
Class III supply data --	5-22	5-46	Main -----	2-21a	2-29
Class V supply data --	5-40	5-93	Rear -----	2-21b	2-30
Troop requirements, type field army -----	4-2e(4)	4-8	Signal communication system -----	4-21	4-102
Weapons, agents, and munitions -----	4-18	4-91	Command(s):		
Civil affairs units:			Air defense -----	1-2b	1-1
Aircraft requirements, type field army -----	4-12b(4)(c)	4-75	Engineer shore assault units -----	1-22-1-25	1-30
Troop requirements, type field army -----	4-2e(15)	4-23	Logistical -----	1-8	1-5
Class I supply (<i>See also</i> Rations.):			Missile, U. S. Army -----	1-26-1-27	1-26
Characteristics -----	5-3	5-2	Posts -----	2-19-2-21	2-25
Installations, combat zone --	5-79b	5-143	Commercial loading methods --	7-49	7-53
Requirements -----	5-53b, c; 5-52-5-62	5-113, 5-114, 5-111	Commodity loading -----	7-50c	7-54
Storage area -----	5-64, 5-68	5-127, 5-131			
Time elements in -----	5-4	5-8			
Class II and IV supply:					
Equipment -----	4-29a, 5-5-5-12	4-111, 5-4			
Installations, combat zone --	5-79b	5-143			

	Paragraphs	Pages		Paragraphs	Pages
Communications, signal (<i>See also</i> Signal.):			Maps and aerial photos:		
Area-type system -----	4-21a	4-102	Distribution -----	3-8	3-5
Basic data -----	4-19	4-101	Functions -----	3-3	3-1
Center -----	4-22	4-103	Requirements -----	3-5, 3-13	3-2, 3-10
Command posts -----	4-21b	4-102	Responsibility -----	3-3	3-1
Means -----	4-23	4-104	Organization -----	1-6, 9-2	1-3, 9-1
Requirements, special -----	4-24	4-106	Supply requirements in		
Users served -----	4-20	4-106	combat -----	5-58	5-124
Communications zone (<i>See also</i>			Troop requirements, type		
Theater army logistical			field army -----	4-2	4-3
command.):			Craft, amphibious,		
Estimates, personnel losses --	2-6	2-9	characteristics -----	7-7a(4)	7-15
Organizational factors -----	9-2	9-1	Date, designation -----	3-15b	3-13
Road net -----	8-5a(2)(b)	8-2	Day of supply -----	5-25e, 5-52	5-48, 5-111
Signal communications -----	4-20b	4-102	Decorations -----	2-14	2-22
Supply requirements -----	5-58	5-124	Defense fortifications -----	4-30	4-116
Troop requirements -----	4-3b	4-25	Demolition(s):		
Construction -----	8-4-8-13	8-2	Harbors -----	8-7c	8-7
Airfield -----	8-12	8-24	Requirements -----	4-32	4-124
Bridge -----	4-29d-h, 8-5b	4-113, 8-3	Density, train -----	7-18	7-25
Bulk petroleum facilities --	8-10	8-19	Department of the Army:		
Equipment, fuel require-			Mapping, responsibility --	3-3	3-1
ments -----	5-18b	5-25	Organization -----	1-1	1-1
Fortifications, field -----	4-30	4-116	Depots:		
General -----	8-9	8-11	Combat zone -----	5-79	5-141
Graveling and culvert -----	8-5b	8-3	Construction -----	8-9e	8-14
Highway -----	8-5	8-2	Map -----	3-7b, 3-8c	3-5, 3-6
Housing -----	8-9b, k	8-11, 8-19	Dimensions and weights (<i>See</i>		
Labor -----	8-4-8-13	8-2	<i>also</i> Weight(s).):		
Materials -----	5-12	5-23	Aircraft -----	7-42b, 7-43c	7-42
Nuclear powerplant -----	8-11	8-21	Class II and IV supply --	5-5-5-12	5-4
Pipeline -----	8-10b	8-19	Map -----	3-7a	3-5
Railway -----	8-6	8-5	Direct exchange criteria,		
Road -----	4-28d, 8-5	4-111, 8-2	maintenance -----	8-17c	8-43
Signal, factors -----	4-23d(4), 8-13	4-105	Distribution:		
Water terminal -----	8-7	8-6	Bulk petroleum -----	5-14, 8-10	5-29, 8-19
Continental United States, hos-			Casualties -----	2-5d(2)-(5), 2-4, 2-6;	
pital bed requirements -----	6-9	6-10	e(3)-(6); 2-7a(2)		2-10
Control, maintenance -----	8-16	8-40	Class II equipment -----	4-29a	4-111
Conversion:			Gazetteers -----	3-10	3-8
Factors -----	10-1-10-7	10-1	Map -----	3-8	3-5
Petroleum products --	5-15	5-30	Supply -----	5-75-5-79	5-137
Storage space -----	5-65	5-130	Water, equipment -----	4-46b	5-108
Time zone -----	3-15f	3-13	Division (<i>See also</i> Airborne,		
Corps:			Armored, and Infantry		
Class V supply, interrela-			division(s).):		
tionship of tactics and am-			Aircraft requirements -----	4-12	4-56
munition service -----	5-26	5-48	Class V supply, interrela-		
Commands posts -----	2-20	2-27	tionship of tactics and		
Estimates:			ammunition service -----	5-26	5-48
Class V expenditures of			Command posts -----	2-19	2-25
artillery, daily -----	5-32b	5-51	Estimates:		
Prisoner-of-war capture			Personnel losses -----	2-5d-g, 2-7	2-4, 2-10
rates -----	2-9	2-20	Prisoner-of-war		
Headquarters -----	1-6b	1-4	capture rates -----	2-9	2-20
Internal arrangement --	2-20	2-27	Headquarters, internal		
Maintenance planning data	8-14-8-19	8-29	arrangement -----	2-18	2-24
			Maintenance planning data	8-14-8-19	8-29

	Paragraphs	Pages
Maps and aerial photos:		
Distribution	3-8	3-5
Functions	3-3	3-1
Requirements	3-5, 3-13	3-2, 3-10
Responsibility	3-3	3-1
Railway net tonnage	7-20	7-25
Slice	4-6, 4-7a, 4-26, 4-30, 5-33, 7-4b, 5-52, 7-2, 9-2a, 9-6a, 9-1, 9-4	
Supply requirements	5-52	5-111
Troop requirements, type field army	4-2	4-3
Dredging	8-8	8-43
Engineer(s):		
Aircraft requirements, type field army	4-12b(4)(b)	4-59
Airfield construction, units	8-12	8-24
Amphibious shore assault units:		
Basic data	1-22	1-30
Organization	1-23	1-30
Vehicles and equipment	1-25	1-37
Weapons	1-24	1-36
Battalion month, construc- tion troops	8-4a, 8-12	8-2, 8-24
Class III supply data	5-24	5-47
Class V supply data	5-41	5-94
Construction	8-4-8-13	8-2
Materials	5-12a	5-23
Equipment:		
Items	5-6, 5-12a	5-7, 5-23
Maintenance:		
Float authorizations	8-17b	8-42
Time factors	8-15d	8-30
Water	5-46b	5-108
Fortification materials	5-12a	5-23
Mapping, responsibility	3-3	3-1
Troop requirements:		
Type field army	4-2e(5)	4-10
Type shore party	4-5	4-26
Engineering, field	4-27-4-34	4-110
Entertainment motion picture service supplies	5-51	5-110
Equipment:		
Airborne division	1-11	1-14
Air movement, required	4-12b(2)	4-57
Armored division	1-15	1-19
Assault landings	4-13b(2)(g)	4-79
Cargo-handling, water terminals	7-6g	7-7
Chemical	5-5, 8-15d, 5-4, 8-30, 8-17b	8-42
Class II, distribution	4-29a	4-111
Construction, fuel requirements	5-13b	5-25
Craft, cargo, inland waterways	7-46	7-51
Engineer	5-6, 5-12a, 5-7, 5-23, 8-15d, 8-17b	8-30, 8-42
Shore assault units	1-22	1-30

	Paragraphs	Pages
Factors	9-6b	9-4
Floating	7-46	7-51
Gap-crossing	4-29	4-111
Infantry division	1-19	1-25
Initial	5-2b, 9-3c	5-1, 9-2
Inland terminals	7-8c	7-17
Logistical over-the-shore operations	7-7b(3)	7-16
Maintenance planning data	8-14-8-19	8-29
Marine	5-13e	5-27
Mechanized division	1-21	1-28
Materials handling:		
Characteristics	5-74	5-135
Requirements	5-72	5-133
Medical	5-7, 8-15d	5-14, 8-30
Missile command, U. S. Army	1-27d	1-37
Ordnance	5-8, 8-15d, 5-16, 8-30, 8-17b	8-42
Organizational, rail loading	7-28	7-29
Outsize	7-23	7-28
Quartermaster	5-9, 8-15d	5-19, 8-30
Railway(s):		
Bridging	4-29h	4-115
Estimates	7-21	7-25
River-crossing	4-13c, 4-30	4-81, 4-116
Signal	5-10	5-20
Transportation	5-11	5-20
Water	5-46b-e	5-108
Terminal	7-6f-h; 7-7a(6)	7-7; 7-15
Estimates:		
Barbed wire obstacles	4-30b(4)(a)	4-116
Casualties	2-5, 6-2-6-5	2-3, 6-1
Class III supply requirements	5-16	5-32
Class V supply expenditures	5-32, 5-33	5-50, 5-52
Construction:		
Administration		
facilities	8-9c	8-12
Billets	8-9i	8-17
Bivouacs	8-9i	8-17
Camps:		
Prisoner of war	8-9i	8-16
Troop	8-9b, i	8-11, 8-16
Depots	8-9e	8-14
Engineer	8-4b	8-2
Hospital	8-9d	8-12
Housing	8-9k	8-19
Iceplants and refig- erated storage	8-9g	8-16
Office space	8-9l	8-19
Personnel service facilities	8-9h	8-16
Prefabricated and standard frame buildings	8-9m	8-19
Shops	8-9f	8-15
Signal	8-18a	8-26
Inland terminals	7-8b-d	7-16

	Paragraphs	Pages		Paragraphs	Pages
Inland waterway capacities	7-45	7-51	Fixed bridges, characteristics	4-29e, f	4-113
Labor, map depots	3-8d	3-6	Fixed-wing aircraft	7-42a, b, 7-41, 7-42, d; 7-43c	7-46, 7-48
Minefield	4-32c	4-124	Capacities	6-11, 7-42b, 6-11, 7-42, 7-43c	7-48
Personnel losses:			Characteristics	7-42b, 7-43c	7-42, 7-48
Combat zone	2-5	2-3	Class III supply data,		
Communications zone	2-6	2-9	Army	7-42b	7-42
Nuclear	2-3	2-2	Planning factors	7-42d(2)	7-46
Theater	2-7	2-10	Flatcars	7-29	7-30
Prisoner of war:			Float criteria, maintenance	8-17a, b	8-42
Camps, construction	8-9i	8-16	Floating:		
Capture rates	2-8-2-10	2-19	Bridges	4-29d	4-113
Railway operations	7-18-7-26	7-25	Equipment	7-46	7-51
Supplies, time for handling	5-71c	5-133	Flow charts:		
Supply level buildup	5-77	5-138	Map	3-8e	3-6
Transportation	7-2, 7-4	7-1, 7-2	Replacement and consump-		
Truck unit capability	7-11b(10)	7-20	tion supplies	5-53	5-111
Water terminal			Forced march	4-8f	4-35
capacities	7-6b, 7-7b(2)	7-4, 7-16	Fords, depth of water	4-33	4-125
European theater:			Formula(s):		
Army exchange supplies	5-48	5-110	Aircraft requirements		
Supply requirements	5-52	5-111	to move supplies	7-41	7-41
Evacuation of patients:			Bed requirements, hospital	6-8a, b	6-8
Factors	6-10, 9-4	6-11, 9-3	Diesel-powered floating		
Policy	6-7c	6-5	equipment, fuel con-		
Time required	6-12	6-12	sumption	5-13e	5-27
Transportation, capacity	6-11	6-11	Division tonnage, net	7-20	7-25
Facilities requirements,			Inland waterways:		
maintenance	8-18a, c	8-45	Capacity	7-45c, d	7-51
Field army:			Floating equipment	7-46	7-51
Class V supply	5-25	5-48	Lines of communications		
Command posts	2-17	2-23	buildup capacity	5-78	5-138
Headquarters	1-5b	1-3	Motor columns:		
Maintenance planning data	8-14-8-19	8-29	Density	4-9b	4-36
Maps and aerial photos:			Time, movement by		
Distribution	3-8	3-5	echelon	4-11e	4-56
Functions	3-3	3-1	Traffic flow	4-9a	4-135
Requirements	3-5, 3-13	3-2, 3-10	Personnel requirements for		
Responsibilities	3-3	3-1	maintenance support	8-15b	8-29
Organization	1-5, 9-2a	1-3, 9-1	Railway equipment,		
Supply requirements	5-59	5-124	determining	7-21	7-25
Troop requirements, type			Road:		
field army	4-2	4-3	Interval	4-9f	4-37
Field artillery (<i>See also</i>			Space	4-9c, 4-10	4-36, 4-38
Artillery.):			Supply buildup, levels	5-77	5-138
Basic loads	5-38a(2)	5-79	Tank farm construction	8-10c	8-20
Class III supply data	5-21b	5-44	Telephone poles, shipping		
Units:			space	8-13b	8-27
Aircraft requirements,			Time:		
type field army	4-12b(4)(b)	4-59	Distance	4-9e	4-37
Troop requirements,			Interval	4-9f	4-37
type field army	4-2e(3)(b)	4-6	Length	4-9d, 4-10	4-37, 4-38
Weapons, characteristics	4-17c(1), (2)	4-87, 4-88	Motor movement by		
Field engineering	4-27-4-34	4-410	echelon	4-11e	4-56
Fortifications	4-30	4-116	Truck company		
Finance units:			requirements	7-12	7-21
Aircraft requirements,			Fortification(s):		
type field army	4-12b(4)(c)	4-75	Field	4-30	4-116
Troop requirements,			Materials	5-12	5-23
type field army	4-2e(15)	4-23			
Firing ranges. (<i>See</i> Ranges,					
firing.)					

	Paragraphs	Pages
Fuel and lubricants. (<i>See also</i> Class III supply and Gasoline.) -----	5-13-5-24	5-24
Gage, railway -----	7-4e, 716b(3), 7-21c(1)(c)	7-2, 7-24, 7-26
Gap-crossing equipment -----	4-29	4-111
Gasoline. (<i>See also</i> Class III supply.):		
Fuel and lubricant data ---	5-13	5-24
Requirements, estimating --	5-16b	5-32
Supply data:		
Airborne division -----	5-17	5-35
Armored division -----	5-18	5-37
Armored units, nondivisional -----	5-20	5-42
Artillery units, nondivisional -----	5-21	5-43
Chemical units -----	5-22	5-46
Infantry division -----	5-19a	5-39
Mechanized division -----	5-19b	5-40
Service units -----	5-24	5-47
U. S. Army Security Agency units -----	5-23	5-47
Gazetteers, map -----	3-10	3-8
Graphs:		
Aircraft payload-distance --	7-43c	7-48
Comparison between radio relay and wire circuit installation time -----	4-23e	4-105
Lines of communications buildup capacity -----	5-78	5-138
Materials handling equipment requirements --	5-72	5-133
Personnel required:		
Procurement -----	5-63a	5-127
Storage -----	5-69	5-132
Road movement -----	4-10i	4-46
Supply levels, buildup -----	5-77b	5-138
Greenwich civil time -----	3-15c	3-13
Grenades, chemical -----	4-18c	4-94
Group, army, organization -----	1-4	1-1
Halts -----	4-8c	4-32
Harbors, dredging -----	8-8	8-9
Headquarters:		
Corps (diagram) -----	1-6b	1-4
Field army (diagram) -----	1-5b	1-3
Internal arrangement -----	2-18-2-21	2-24
Corps (diagram) -----	2-20	2-27
Division (diagram) -----	2-19	2-25
Field army (diagram) --	2-21	2-29
Logistical command -----	1-8	1-5
Type A (chart) -----	1-8d(1)(a)	1-6
Type B (chart) -----	1-8d(2)(a)	1-9
Type C (chart) -----	1-8d(3)(a)	1-10
Units:		
Aircraft requirements, type field army -----	4-12b(4)(c)	4-75
Troop requirements, type field army -----	4-2e(15)	4-23

	Paragraphs	Pages
Helicopters. (<i>See</i> Rotary- wing aircraft.)		
Highway:		
Bridge(s):		
Construction -----	8-5b(5)	8-3
Fixed -----	4-29e, f, h	4-113, 4-115
Capabilities, tonnage -----	7-4f, 7-13	7-3, 7-22
Capacities -----	9-5a	9-3
Communication system -----	4-24d	4-107
Construction -----	8-5	8-2
Hauls:		
Line -----	7-10a(2), 7-11b(3), (4)	7-19
Local -----	7-10a(1), 7-11b(3), (4)	7-18, 7-19
Transportation -----	7-10-7-13	7-18
Operations -----	7-10	7-18
Planning factors -----	7-11, 7-12, 7-19, 7-21, 9-5b	9-3
Historical units:		
Aircraft requirements, type field army -----	4-12b(4)(c)	4-75
Troop requirements, type field army -----	4-2e(15)	4-23
Hospital:		
Accumulation factors -----	6-7d	6-5
Admission rates -----	6-2-6-5	6-1
Bed requirements -----	6-6-6-9	6-4
Chaplain positions -----	2-17a(3)	2-23
Construction -----	8-9d	8-12
Dispersion factor -----	6-7g	6-5
Evacuation policy -----	6-7c	6-5
Factors, hospitalization -----	9-4	9-3
Requirements -----	9-4	9-3
Housing construction:		
Administrative facilities ---	8-9c	8-12
Requirements -----	8-9k	8-19
Troop -----	8-9b	8-11
Human bearers -----	7-58	7-66
Hydrographic features -----	4-13b(2)	4-78
Ice:		
Capacity, load-bearing -----	4-34	4-125
Plants, construction -----	8-9g	8-16
Infantry Division. (<i>See also</i> Division.):		
Air movement -----	4-12a(1), 7-4h	4-56, 7-3
Class III supply data -----	5-19a	5-39
Class V supply data -----	5-36	5-70
Equipment -----	1-19	1-25
Estimates:		
Personnel losses -----	2-5d, e, g; 2-7a(2)	2-4, 2-5, 2-7; 2-10
Prisoner-of-war capture rates -----	2-9, 2-10a	2-20, 2-21
Headquarters, internal arrangement -----	2-19	2-25
Maintenance planning data --	8-14-8-19	8-29
Maps and aerial photos:		
Distribution -----	3-8	3-5

	Paragraphs	Pages		Paragraphs	Pages
Functions	3-3	3-1	Legal services	9-7	9-4
Requirements	3-5, 3-13	3-2, 3-10	Ligherage:		
Responsibility	3-3	3-1	Discharge rates	7-4a, 7-6d, 9-5a	7-2, 7-6
Motor move, time factors ..	4-10g	4-42	Wharf requirements	7-6c(3)	7-6
Organization	1-12	1-16	Lines of communications:		
Rail movement	7-31c, 7-36	7-32, 7-37	Capabilities	7-3	7-1
Road space and time			Capacities	5-78	5-138
lengths	4-10b-g	4-38	Factors concerning	7-3b, c	7-1
Table, format	4-10e	4-40	Loading:		
Slice	4-6, 4-7a, 4-26, 4-30, 5-53, 9-2a	5-111, 9-1	Cargo ships	7-4a	7-2
Supply requirements	5-62	5-125	Commercial methods	7-50	7-53
Training	4-14, 4-15	4-82, 4-83	Fixed-wing aircraft	7-42d(2)(f), 7-43c	7-47 7-43
Transportation require-			Military methods:		
ments	9-5b	9-3	Administrative	7-50b	7-54
Troop requirements,			Combat	7-50a	7-54
type field army	4-2	4-3	Commodity	7-50c	7-54
Vehicles	1-19	1-25	Selective	7-50d	7-54
Losses	8-19	8-46	Railway cars	7-28, 7-30, 7-29, 7-30, 7-35, 7-39	7-36, 7-40
Weapons	1-18, 4-17b	1-24, 4-85	Times for loading	7-34e	7-36
Infantry units, nondivisional:			Rotary-wing aircraft	7-42c(2)(f)	7-43
Aircraft requirements,			Vehicles	7-11b(7)	7-20
type field army	4-12b(4)(b)	4-59	Locomotives:		
Troop requirements,			Dimensions and weights	5-11	5-20
type field army	4-2e(6)	4-12	Fuel and lubricants	5-13d, 5-16a(2)	5-27, 5-32
Inland waterways	7-44-7-46	7-50	Logistical commands:		
Capacities	7-45	7-51	Headquarters	1-8b, d	1-5, 1-6
Characteristics	7-45b	7-51	Service units	1-8c	1-5
Types	7-45a	7-51	Type A	1-8d(1)	1-6
Installations:			Type B	1-8d(2)	1-9
Supply, combat zone	5-79	5-141	Type C	1-8d(3)	1-10
Intelligence:			Logistical data for military		
Aerial photography	3-12-3-14	3-9	fixed highway bridges	4-29h	4-115
Maps	3-2-3-11	3-1	Logistical over-the-shore		
Natural phenomena	3-16	3-13	operations	7-7b	7-15
Planning data	3-1, 3-5f	3-1, 3-4	Losses and replacements:		
Tides, sunlight, and			Categories of losses	2-2a	2-1
moonlight, diagram	3-16e	3-18	Communications zone		
Time	3-15, 3-16	3-13	estimates	2-5	2-3
Units, military	4-2e(8)	4-14	Combat zone estimates	2-6	2-9
Judge Advocate General:			Experience, loss	2-2d	2-2
Legal services	9-7	9-4	Gross losses, definition	2-2b	2-1
Units:			Net losses, definition	2-2c	2-2
Aircraft requirements,			Nuclear loss estimates	2-3	2-2
type field army	4-12b(4)(c)	4-75	Theater estimates,		
Troop requirements,			nonnuclear	2-7	2-10
type field army	4-2e(15)	4-23	Unit replacements	2-4	2-3
Kitchen(s):			Lubricants. (See Class III		
And kitchen-baggage cars ..	7-29	7-30	supply and Gasoline.)		
Preparation of food	5-4	5-3	Mail	2-15	2-22
Labor:			Maintenance	8-14-8-19	8-29
Construction	8-4-8-13	8-2	Control	8-16	8-40
Fortifications, field	4-30	4-116	Direct exchange criteria	8-17c	8-43
Maintenance planning data ..	8-14-8-19	8-29	Fixed-wing aircraft	7-42d(2)(d)	7-47
Map depots	3-8d	3-6	Float criteria	8-17a, b	8-42
Supplies, handling	5-71	5-132	Initial equipment plus		
Landing craft	7-7a(3)(b), (c)	7-9, 7-10	30 days	5-2b, 9-3c	5-1, 9-2
Leadtime, procurement	5-63b	5-127			

	Paragraphs	Pages		Paragraphs	Pages
Railway organizations -----	7-25c	7-28	Messengers -----	4-23f	4-105
Requirements -----	9-3	9-2	Military intelligence units:		
Facilities -----	8-18a, c	8-45	Aircraft requirements,		
Personnel -----	8-15	8-29	type field army -----	4-12b(4)(b)	4-59
Utilities -----	8-18b	8-45	Troop requirements,		
Roads and highways -----	8-5d	8-4	type field army -----	4-2e(8)	4-14
Rotary-wing aircraft -----	7-42c(2)(d)	7-43	Military police units:		
Supplies, flow -----	5-53	5-111	Aircraft requirements,		
Time factors for selected			type field army -----	4-12b(4)(b)	4-59
items of equipment -----	8-15d	8-30	Troop requirements:		
Vehicle losses -----	8-19	8-46	Type field army -----	4-2e(9)	4-15
Map(s):			Type short party -----	4-5	4-26
Aeronautical charts,			Mine(s):		
requirements -----	3-5b(1)(d),	3-3	Chemical -----	4-18c,	4-94,
	3-5b(2)			4-31b	4-119
Allowances -----	3-5b	3-2	Fields -----	4-31	4-118
Depots -----	3-7b, 3-8c	3-5, 3-6	Missile command, U. S. Army --	1-26, 1-27	1-38
Distribution -----	3-8	3-5	(Air transportable):		
Estimates -----	3-5b(1)	3-2	Capabilities -----	1-27b	1-38
Functions -----	3-3	3-1	Organization chart ---	1-27a	1-38
Gazetteers -----	3-10	3-8	Vehicles and equipment.	1-27d	1-39
Plastic relief -----	3-9	3-8	Weapons -----	1-27c	1-39
Production -----	3-6	3-4	Modern Army supply system ---	5-76	5-138
Requirements,			Moonlight, factors -----	3-16b(5), 3-16e	3-15, 3-18
determining -----	3-5, 3-9, 3-11	3-2, 3-8	Motor columns:		
Responsibility -----	3-3, 3-8b,	3-1, 3-6,	Density -----	4-9b	4-36
	3-11e(1)	3-9	Road:		
Scales -----	3-4b	3-1	Interval -----	4-9f	4-37
Storage -----	3-7	3-5	Space -----	4-9c, 4-10	4-36, 4-38
Strip -----	4-10k	4-50	Time:		
Terrain models -----	3-9	3-8	Distance -----	4-9e	4-37
Types -----	3-4a	3-1	Interval -----	4-9f	4-37
Weights and sizes -----	3-7a	3-5	Length -----	4-9d, 4-10	4-37, 4-38
March(es). (See also			Traffic flow -----	4-9a	4-35
Movement.):			Movement:		
Calculator -----	4-10n	4-53	Air -----	4-12,	4-56
Forced -----	4-8f	4-35		7-40-7-43	7-41
Marine equipment fuel and			Fixed-wing -----	7-42d, 7-43	7-46, 7-48
lubricants -----	5-13e	5-27	Rotary-wing -----	7-42c	7-42
Materials:			Supplies -----	7-41	7-41
Construction -----	5-12	5-23	Amphibious operations -----	4-13b	4-77
Handling equipment -----	5-72-5-74	5-133	Communication system -----	7-21c	7-26
Medical:			Foot -----	4-8, 4-10	4-31, 4-38
Aircraft requirements,			Motor -----	4-8-4-11	4-31
type field army -----	4-12b(4)(b)	4-59	Density of columns ----	4-9b	4-36
Class III supply data -----	5-24	5-47	Echelon, by -----	4-11	4-55
Equipment:			Traffic flow of columns.	4-9a	4-35
Assemblages -----	5-7	5-14	Railway -----	7-16-7-39	7-24
Maintenance time			Road -----	4-8-4-11	4-31
factors -----	8-15d	8-30	Water -----	4-13	4-77
Evacuation -----	6-1-6-12	6-1	Natural phenomena -----	3-16	3-13
Hospitalization -----	6-1-6-12	6-1	Navy units, troop require-		
Troop requirements:			ments, type shore party -----	4-5	4-26
Type field army -----	4-2e(7)	4-12	Nuclear:		
Type shore party -----	4-5	4-26	Biological, and chemical		
Messages, transmission -----	4-23a	4-104	casualties, hospital bed		
Speed -----	4-22d	4-103	requirements -----	6-8c	6-9

	Paragraphs	Pages		Paragraphs	Pages
Loss estimates -----	2-3	2-3	Personnel -----	2-1—2-17	2-1
Powerplants -----	8-11	8-21	Construction -----	4-30, 8-4—8-13	4-116, 8-2
Ocean shipping -----	7-47—7-54	7-52	Estimates, loss:		
Nomenclature of vessels ---	7-51	7-54	Airborne operations --	2-5f	2-6
Oil supply. (See Class III			Combat zone -----	2-5	2-3
supply and Gasoline.)			Communications zone --	2-6	2-9
Open column -----	4-10	4-38	Nuclear -----	2-3	2-2
Ordnance:			Theater, nonnuclear ---	2-7	2-10
Aircraft requirements,			Losses and replacements ---	2-2—2-7	2-1
type field army -----	4-12b(4)(b)	4-59	Maintenance planning data	8-14—8-19	8-29
Class V supply data -----	5-25, 5-26	5-48	Map depots -----	8-8d	3-6
Equipment:			Procurement, required ---	5-63a	5-127
Items -----	5-8	5-16	Railway operation -----	7-24, 7-25	7-28
Maintenance:			Services -----	2-13—2-15	2-22
Float author-			Slices -----	4-6, 4-7, 4-26, 4-30,	
izations -----	8-17b	8-42	5-53, 7-4b, 5-111, 7-2,		
Time factors -----	8-15d	8-30	9-2		9-1
Troop requirements:			Storage operations -----	5-69	5-132
Type field army ---	4-2e(10)	4-17	Supplies, handling -----	5-71	5-132
Type shore party ---	4-5	4-26	Troop requirements,		
Organization:			type field army -----	4-2	4-3
Airborne division -----	1-9	1-12	Water terminal operation --	7-6f	7-7
Air defense commands -----	1-2b	1-1	Photography characteristics of		
Armored division -----	1-12	1-16	equipment. (See also Aerial		
Army areas -----	1-2a	1-1	photography.) -----	4-26	4-110
Army group -----	1-4	1-1	Physical constants -----	10-8—10-13	10-3
Corps -----	1-6	1-3	Pictorial services, signal -----	4-25	4-108
Department of the Army ---	1-1	1-1	Pipeline(s):		
Engineer shore assault units	1-22	1-30	Capabilities -----	7-15	7-23
Factors, logistical -----	9-2	9-1	Capacities -----	7-4g, 7-15	7-3, 7-23,
Field army -----	1-5	1-3	9-5a		9-3
Infantry division -----	1-12	1-16	Communications -----	4-24c,	4-107,
Logistical commands -----	1-8	1-5	8-10d		8-21
Mechanized division -----	1-12	1-16	Construction -----	8-10b	8-19
Missile command,			Operations -----	8-10e	8-21
U. S. Army -----	1-26	1-38	Planning data:		
Task force -----	1-7	1-4	Base development -----	8-3	8-1
Theater army -----	1-3	1-1	Chaplain -----	2-17	2-23
Umpire, for exercises ---	4-16	4-83	Highway transportation ---	7-10, 7-11	7-18, 7-19
Pacific theater:			Logistical, general -----	9-1—9-7	9-1
Army exchange supplies ---	5-48	5-110	Maintenance -----	8-14—8-19	8-29
Supply requirements -----	5-55	5-120	Map requirements -----	3-5f	3-4
Paper supplies -----	5-49	5-110	Patient evacuation -----	6-10	6-11
Patients			Railway operations -----	7-17—7-26	7-24
Accumulation factors -----	6-7d	6-5	Terminal -----	7-5b	7-4
Admission rates -----	6-2	6-1	Water -----	8-7a	8-6
Classification -----	6-1	6-1	Transportation -----	7-2, 7-4	7-1, 7-2
Dispersion factor -----	6-7g	6-5	Troop -----	4-1—4-7	4-1
Evacuation policy -----	6-7a	6-4	Movement -----	7-34	7-36
Transportation -----	6-11, 6-12	6-11, 6-12	Vessel characteristics ---	7-52	7-55
Payloads:			Plastic relief maps -----	3-9	3-8
Fixed-wing aircraft -----	7-42d(2)(h)	7-48,	POL. (See Class III supply and		
7-43c		7-48	and Gasoline.)		
Rotary-wing aircraft -----	7-42c(2)(g)	7-44	Polar regions, supply		
Sled trains -----	7-57b(2)	7-65	requirements -----	5-57	5-122
Vehicle -----	7-11b(2), (10)	7-19, 7-20	Ports. (See Terminals, water.)		
			Power units, fuel		
			requirements -----	5-13f	5-28

	Paragraphs	Pages		Paragraphs	Pages
Prisoner of war:			Rehabilitation:		
Camps, construction -----	8-9i	8-16	Railway -----	8-6b	8-5
Capture rates, estimates ---	2-8-2-10	2-19	Road -----	4-28d, 8-5a, c 4-111, 8-2,	8-4
Procurement:			Water terminal -----	8-7a(3), (4)	8-7
Leadtimes -----	5-63b	5-127	Replacement(s). (See also		
Operations -----	5-63a	5-127	Losses and replacements.):		
Production of maps -----	3-6, 3-11e	3-4, 3-9	Direct exchange of items		
Public information units:			of equipment -----	8-17c	8-43
Aircraft requirements,			Unit(s) -----	2-4	2-3
type field army -----	4-12b(4)(c)	4-75	Aircraft requirements,		
Troop requirements,			type field army -----	4-12b(4)(c)	4-75
type field army -----	4-2e(15)	4-23	Troop requirements,		
Quartermaster:			type field army -----	4-2e(15)	4-23
Aerial supply companies --	7-9c(3)	7-18	Required supply rate -----	5-29	5-49
Aircraft requirements,			Requirements:		
type field army -----	4-12b(4)(b)	4-59	Aerial photography -----	3-13	3-10
Class III supply data -----	5-24	5-47	Aircraft -----	4-12,	4-56
Equipment:			7-42c(2)(h),		7-45,
Items -----	5-9	5-19	9-5b		9-3
Maintenance time			Supplies -----	7-41	7-41
factors -----	8-15d	8-30	Barbed-wire obstacle -----	4-30b(4)(a)	4-116
Troop requirements,			Base development, logistical	8-3c, d	8-1
type field army -----	4-2e(11)	4-19	Beach operations:		
Radio -----	4-23b,	4-104,	Equipment -----	7-7a(5)	7-15
4-26		4-110	Personnel -----	7-7a(6)	7-15
Rafts -----	4-29c	4-113	Bridges -----	8-5b	8-3
Railway(s). (See also			Chaplain ecclesiastical		
Train(s).) -----	7-16-7-39	7-24	items of supply -----	2-17b	2-23
Bridges -----	4-29g	4-113	Chemical ammunition -----	4-18d	4-101
Capacities -----	9-5a	9-3	Class III supply -----	5-16-5-24	5-32
Car loading -----	7-28, 7-30, 7-29, 7-30,		Communication facilities --	4-20c, 4-24	4-102,
7-34e, 7-35, 7-36, 7-36,			4-106		
7-39		7-40	Construction:		
Construction -----	8-6	8-5	General -----	8-9	8-11
Foreign -----	7-4e,	7-2	Road -----	8-5b	8-3
7-21c(1)(c),		7-26	Craft, inland waterways --	7-46	7-51
7-33		7-36	Demolition -----	4-32	4-124
Gages -----	7-4e, 7-16b(3),	7-2, 7-24,	Hospital bed -----	6-6-6-9, 9-4	6-4, 9-3
7-21c(1)(c)		7-26	Inland terminals, personnel	7-8d	7-17
Movement -----	7-16-7-39	7-24	Maintenance -----	9-3	9-2
Rehabilitation -----	8-6b	8-5	Facilities -----	8-18a, c	8-45
Rolling stock,			Personnel -----	8-15	8-29
characteristics -----	7-22	7-27	Utilities -----	8-18b	8-45
Service communication			Map -----	3-5, 3-9, 3-11	3-2, 3-8
system -----	4-24b	4-106	Materials handling		
Types and capacities -----	7-21c,	7-26,	equipment -----	5-72	5-133
7-22-7-27		7-27	Personnel. (See also		
Ranges, firing -----	4-14, 4-15d, 4-82, 4-83,		Requirements, troop(s).):		
4-17		4-84	Beach operations -----	7-7a(5)	7-15
Rations. (See also			Inland terminals -----	7-8d	7-17
Class I supply.):			Railway operations -----	7-24, 7-25	7-28
Characteristics -----	5-3	5-2	Railway:		
Handling and preparation --	5-4	5-3	Personnel for operation	7-24, 7-25	7-28
References -----	App.	A-1	Troop movement -----	7-27, 7-31	7-29, 7-30
Shipping -----	7-48	7-53	Road construction -----	8-5b	8-3
			Ship:		
			Unloading -----	7-7a(2)	7-9
			Utilities at wharves --	8-7d	8-8

	Paragraphs	Pages
Storage	5-65	5-130
Supply	5-52-5-62	5-111
Levels	5-77	5-138
Terrain model	3-9	3-8
Transportation	7-4	7-2
Truck companies	7-11, 7-12	7-19, 7-21
Trig lists	3-11	3-8
Troop(s):		
Airborne operations	4-4	4-25
Amphibious operations	4-5	4-26
Movements by railway	7-27, 7-31	7-29, 7-30
Theater army logistical command	4-3	4-24
Type field army	4-2	4-23
Umpires, for exercises	4-17	4-84
Water	5-46a	5-106
Requisition and shipping times	5-75	5-137
River-crossing equipment	4-13c, 4-29	4-81, 4-111
Road(s):		
Capacities	4-28b	4-110
Construction	4-28d, 8-5	4-111, 8-2
Maintenance	8-5d	8-4
Movement	4-8-4-11	4-41
Nets	8-5a(2)	8-2
Rehabilitation	8-5a, c	8-2, 8-4
Rolling stock, characteristics	7-22	7-27
Rotary-wing aircraft	7-42a-c	7-41
Characteristics	7-42b	7-42
Planning factors	7-42c(2)	7-42
Sailing distances	7-53	7-61
Selective loading	7-50d	7-54
Semitrailers. (See also Vehicle(s).)	5-8	5-16
Service(s):		
Legal	9-7	9-4
Troop factors	9-6a	9-4
Units, selected:		
Class III supply data	5-24	5-47
Class V supply data	5-45	5-106
Ship(s):		
Amphibious, characteristics	7-7a(3)	7-9
Cargo, capacities	9-5a	9-3
Loading terms	7-47	7-52
Nomenclature	7-51	7-54
Shipping:		
Discharge rates	7-6d, h	7-6, 7-8
Loading, methods	7-49, 7-50	7-53
Ocean	7-47-7-54	7-52
Nomenclature of vessels	7-51	7-54
Planning factors	7-4a-d	7-2
References	7-48	7-53
Requirements, assault division	7-4b	7-2
Times	5-74	5-135
Turnaround	7-54	7-63
Vessel, cargo characteristics	7-52	7-55
Wharves	7-6c	7-5

	Paragraphs	Pages
Shops, construction	8-9f	8-15
Shore party troop list, type	4-5	4-26
Signal:		
Communications	4-19-4-26	4-101
Construction factors	4-23d(4), 8-13	4-105, 8-26
Means	4-23	4-104
Radio	4-23b	4-104
Requirements, special	4-24	4-106
Speed of transmission	4-22d	4-103
Television	4-23c	4-104
Wire	4-23d	4-104
Equipment	4-26, 5-10	4-110, 5-20
Fortification materials	5-12b	5-23
Mapping, responsibility	3-3	3-1
Pictorial services	4-25	4-108
Units:		
Aircraft requirements, type field army	4-12b(4)(b)	4-59
Class III supply data	5-24	5-47
Class V supply data	5-42	5-94
Power	5-13f	5-28
Troop requirements:		
Type field army	4-2e(12)	4-20
Type shore party	4-5	4-26
Site area	5-64t, v, w; 5-68	5-129, 5-130, 5-131
Sled trains	7-57	7-65
Slice:		
Division	4-6, 4-7a, 4-26, 4-30, 5-53, 7-4b, 5-111, 7-2, 9-2a	9-1
Theater	4-6, 4-7, 4-26, 4-30, 5-53, 9-2	5-111, 9-1
Wing	4-6, 4-7b, 4-26, 4-30, 5-53, 9-2b	5-111, 9-1
Smoke, chemical	4-18a	4-91
Solid fuels	5-16a	5-32
Special services supplies	5-46	5-106
Special warfare units:		
Aircraft requirements, type field army	4-12b(4)(c)	4-75
Troop requirements, type field army	4-2e(15)	4-23
Storage	5-64-5-74	5-127
Area, requirements	5-65a	5-130
Bulk petroleum facilities, construction	8-10	8-19
Construction	8-9e, g	8-14, 8-16
Definition of terms	5-64	5-127
Maps	3-7	3-5
Personnel	5-69, 5-71	5-132
Space:		
Covered	5-66-5-68	5-131
Open	5-66-5-68	5-131
Strip map	4-10k	4-50

FM 101-10-1

	Paragraphs	Pages
Sunlight, factors -----	3-16	3-13
Supplies:		
Adjutant general -----	5-47	5-109
Air movement -----	4-12b(2), 7-42	4-57, 7-41
Amphibious operations, movement -----	7-4d	7-2
Army exchange -----	5-48	5-110
Entertainment motion picture service -----	5-51	5-110
Flow -----	5-53	5-111
Special services -----	5-50	5-110
Supply:		
Air movement, required -----	4-12b(2)(b)	4-57
Amphibious assault -----	4-13b(3)(e)	4-81
Buildup -----	5-77, 5-78	5-122, 5-124
Chaplain -----	2-17b	2-23
Class I -----	5-3, 5-4	5-2, 5-3
Class II and IV -----	5-5-5-12	5-4
Class III -----	5-13-5-24	5-24
Class V -----	5-25-5-45	5-48
General factors -----	5-2	5-1
Installations, combat zone -----	5-79	5-141
Levels, buildup -----	5-77	5-138
Maintenance requirements -----	9-3	9-2
Miscellaneous -----	5-43-5-51	5-103
Modern Army supply system -----	5-76	5-138
Paper -----	5-49	5-110
Points -----	5-79	5-141
Requirements -----	5-52-5-62	5-111
Water -----	5-64	5-127
Tanks, storage -----	8-10c	8-20
Task force, organization -----	1-7	1-4
Telephone -----	4-23d(2)	4-105
Installations:		
Capacities -----	8-13d-f	8-28
Poles, characteristics -----	8-13b	8-27
Requirements:		
Instrument -----	8-13f	8-28
Space -----	8-13g	8-28
Television -----	4-23c	4-104
Tentage, construction -----	8-9i(2)	8-18
Tent camps, construction -----	8-9i(1)(b)	8-17
Terminals -----	7-5, 7-9	7-3, 7-17
Air -----	7-9	7-17
Inland -----	7-8	7-16
Types -----	7-5a	7-3
Water:		
Beaches -----	7-4a, 7-7	7-2, 7-9
Capacity estimation -----	7-6b, h	7-4, 7-8
Construction -----	8-7	8-6
Dredging -----	8-8	8-9
Equipment -----	7-6f	7-7
Facilities -----	7-6c	7-5
Personnel -----	7-6f	7-7
Rehabilitation -----	8-7a(3), (4)	8-7
Terrain models -----	3-9	3-8

	Paragraphs	Pages
Theater:		
Army logistical command.		
(See also Communications zone.):		
Maintenance planning data -----	8-14-8-19	8-29
Troop requirements -----	4-3	4-24
Army organization -----	1-3	1-1
Estimates:		
Personnel losses:		
Nonnuclear -----	2-7	2-10
Prisoner-of-war capture rates -----	2-10	2-21
Maintenance planning data -----	8-14-8-19	8-29
Slices -----	4-6, 4-7, 4-26, 4-30, 5-53, 9-2	5-111, 9-1
Tides -----	3-16, 4-13b(2)(a)	3-13, 4-78
Time:		
Between moons -----	10-13	10-3
Conversion table, zone -----	3-15f	3-13
Designation -----	3-15a	3-13
Distance -----	4-9e, 4-10f	4-37, 4-42
Factors:		
Assault landing -----	4-13b(2)(j), (8)(b)	4-80
Class I supply -----	5-4	5-3
Evacuation of patients -----	6-12	6-12
Field fortifications, construction -----	4-30	4-116
Maintenance -----	8-15d	8-30
Motor move, division -----	4-10g, h	4-42, 4-44
Greenwich civil -----	3-15c	3-13
Intervals:		
Motor move -----	4-9f	4-37
Requisition and shipping times -----	5-75	5-137
Length, motor column -----	4-9d, 4-10d	4-37, 4-40
Natural phenomena -----	3-16	3-13
Shipping -----	5-75	5-137
Suffixes -----	3-15d	3-13
Turnaround:		
Craft, inland waterways -----	7-45b	7-51
Shipping -----	7-54	7-63
Zone chart -----	3-15e	3-13
Tractors. (See also Vehicle(s).) -----	5-8	5-16
Traffic:		
Capacity -----	4-28a, 7-13	4-110, 7-22
Flow of motor columns -----	4-9a	4-35
Trailers. (See also Vehicle(s).) -----	5-8	5-16
Train(s). (See also Railway(s).):		
Capacity -----	9-5a	9-3
Consist table -----	7-37	7-39
Density -----	7-18	7-25
Entraining table -----	7-38	7-39
Load, net -----	7-19	7-25

	Paragraphs	Pages		Paragraphs	Pages
Loading plan, individual	7-39	7-40	Umpires, for exercises	4-16, 4-17	4-83, 4-84
Sled	7-58	7-66	Units(s):		
Training	4-14-4-17	4-82	Equivalents, construction	8-4c	8-2
Facilities	4-15	4-83	Loading	7-50	7-53
Transportation:			Mapping, responsibility	3-3	3-1
Air	7-40-7-43	7-41	Replacements	2-4	2-3
Aircraft:			Troop requirements, type		
Air Force transport	7-43, 9-5b	7-48, 9-3	field army	4-2	4-3
Army:			U. S. Army missile command	1-26, 1-27	1-38
Fixed-wing	7-42a, b, 7-41, 7-42, d	7-46	U. S. Army Security Agency		
Rotary-wing	7-42a-c	7-41	units:		
Requirements, type			Aircraft requirements, type		
field army	4-12b(4)(b)	4-59	field army	4-12b(4)(b)	4-59
Animals, pack	7-56	7-65	Class III supply data	5-23	5-47
Capacities of mediums	9-5a	9-3	Class V supply data	5-40	5-93
Class III supply data	5-24	5-47	Troop requirements, type		
Equipment	5-11	5-20	field army	4-2e(14)	4-22
Estimates	7-2	7-1	Utilities requirements	5-16a(1), 8-7d, 8-18b	5-32, 8-8, 8-45
Highway	7-10-7-13	7-18			
Human bearers	7-58	7-66	Vehicle(s) (See also Movement and Truck(s).):		
Infantry division, requirements	9-5b	9-3	Airborne division	1-11	1-14
Patients	6-11, 6-12	6-11, 6-12	Ammunition, combat	5-31	5-49
Planning	7-2	7-1	Amphibious assault	4-13b(3)(e)	4-81
Factors	7-4	7-4	Armored division	1-17	1-22
Sled trains	7-57	7-65	Assignment table	4-10m	4-53
Troop requirements:			Availability:		
Type field army	4-2e(13)	4-22	Operation	7-11b(1)	7-19
Type shore party	4-5	4-26	Table	4-10l	4-50
Trig lists	3-11	3-8	Capacity:		
Troop(s):			Payload	7-11b(2), (10)	7-19, 7-20
Camps, construction	8-9b	8-11	Personnel, on road		
Factors, service	9-6a	9-4	movements	4-8g	4-35
Movement:			Resupply, ammunition	5-38c	5-90
Air	4-12, 7-40, 4-56, 7-41, 7-43	7-48	Combat, weapons,		
Rail	7-27-7-39	7-29	characteristics	4-17a	4-84
Tactical	4-8-4-13	4-31	Dimensions and weights	5-6, 5-8-5-10, 7-34	5-7, 5-16, 7-36
Planning	4-1-4-7	4-1	Engineer shore assault		
Requirements:			units	1-25	1-37
Airborne operations	4-4	4-25	Fuel and lubricants	5-13a	5-24
Amphibious operations	4-5, 4-13b(2)(i)	4-26, 4-80	Infantry division	1-19	1-25
Beach operations	7-7a(6)	7-15	Loading capacity:		
Maintenance personnel	8-15	8-29	Cargo ships	7-52f, g	7-58, 7-59
Theater army logistical			Railway, recommended	7-30	7-30
command	4-3	4-24	Losses in combat	8-19	8-46
Type field army	4-2	4-3	Marking	4-28c(2)	4-110
Truck(s) (See also Vehicles(s).)	5-8	5-16	Missile command, U. S.		
Amphibious	7-7a(3)(d)	7-11	Army	1-27d	1-39
Capacities	4-8g, 7-11	4-35, 7-19	Payload	7-11b(2), (10)	7-19, 7-20
Companies:			Vessels, cargo:		
Capabilities	7-11	7-19	Capacities	7-4a, 7-52	7-2, 7-55
Planning factors	7-11	7-19	Characteristics	7-52	7-55
Requirements	7-12	7-21	Discharge rates	7-4a, 7-6d, 9-5a	7-2, 7-6, 9-3
Dimensions and weights	5-6, 5-8-5-10	5-7, 5-16	Equipment, handling and		
Tractors	5-8	5-16	operating	7-6g, h	7-7, 7-8
Twilight, periods	3-16c	3-16			

	Paragraphs	Pages		Paragraphs	Pages
Volume(s):			Special forces group,		
Conversion factors -----	10-7	10-2	airborne -----	1-28c	1-42
Petroleum products -----	5-15	5-30	Towed -----	5-8	5-16
Water:			Weight(s) (<i>See also</i> Dimensions		
Fordable depth -----	4-33	4-125	and weights and Supply.):		
Movement -----	4-13	4-77	Conversion factors -----	10-1	10-1
Supply and requirements --	5-46	5-106	Petroleum products -----	5-15	5-30
Terminals (<i>See</i> Terminals,			Tracked vehicles -----	7-32	7-35
water.)			Vessels:		
Waterways, inland (<i>See</i>			Cargo -----	7-52	7-55
Inland waterways.)			Oceangoing -----	7-51	7-54
Weapons (<i>See also</i> Basic load			Wharves:		
and Class V supply.):			Construction -----	8-7	8-6
Airborne division -----	1-9	1-12	Requirements -----	7-6c(3)	7-6
Armored division -----	1-16	1-21	Wing slice -----	4-6, 4-7b, 4-26, 4-30,	
Characteristics -----	4-17, 4-18	4-84, 4-91		5-53, 9-2b 5-111, 9-1	
Engineer shore assault units	1-22	1-30	Wire:		
Infantry division -----	1-18	1-24	Barbed -----	4-30b(4)	4-116
Mechanized division -----	1-20	1-27	Signal means -----	4-23d	4-104
Missile command, U. S.			Characteristics -----	4-26a	4-110
Army -----	1-27c	1-39	World geographic reference		
Self-propelled -----	5-8	5-16	system -----	3-17, 3-18	3-19

By Order of the Secretary of the Army:

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USACDCARTYA (7)	USACHS (5)	USACDCCSSG (20)
USACDCCARMSA (7)	USACMLSC (50)	USACDCIAS (5)
USACDCMPA (5)	USACSS (4)	USACDCNG (5)
USACDCMSA (5)	USAFS (60)	USACDCSWCAG (5)
USACDCQMA (5)	USAINTS (6)	USACDCEC (5)
USACDCSWA (5)	USAOGMS (5)	USA Pdn Equip Agcy (1)
USACDCINTA (4)	USAPHS (5)	USARSG (8)
USACDCCBRA (3)	USASWS (50)	Springfield Armory (3)

NG: State AG (3); units—same as active Army.

USAR: Units—same as active Army except allowance is one copy to each unit.

For explanation of abbreviations used, see AR 320-50.

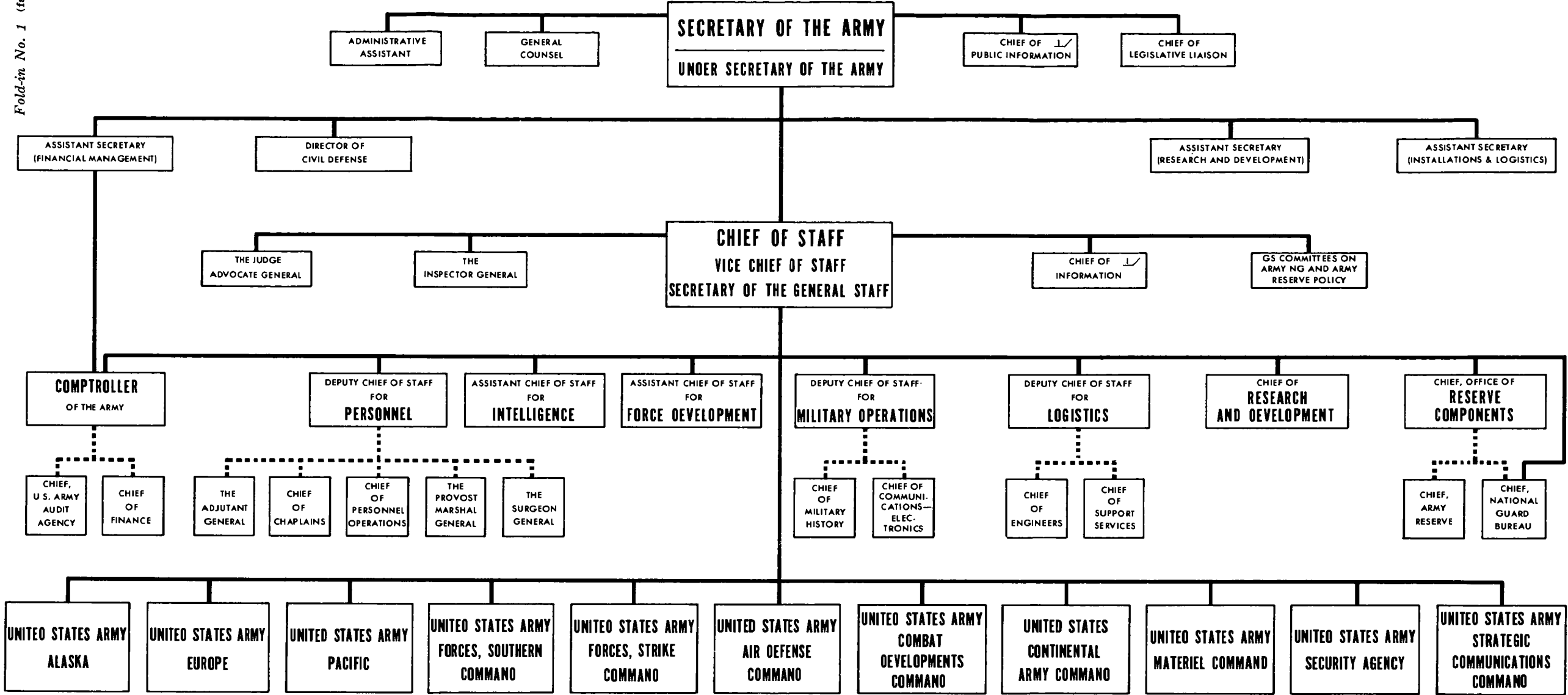


1.



ORGANIZATION OF THE DEPARTMENT OF THE ARMY

Fold-in No. 1 (faces p. 1-2)



1/ THE CHIEF OF PUBLIC INFORMATION ALSO SERVES AS CHIEF OF INFORMATION.

Figure 1-1

Based on TOE ----- dated -----.

† Based on 20 men per 2½-ton truck with trailer.

General. Use data in *d* above as guide in completing form.

Columns 2, 3, and 9: Based on periodic reports of subordinate units.

Column 6: Group which normally precedes main body to a new area for reception of troops.

Column 7: Vehicles not required for immediate support, such as kitchen, baggage, motor maintenance, are designated field trains.

Column 10: Number of men on foot (coln 9) x 1.2 or 2.7 (para 4.8b(1)) + unit intervals = meters.

Columns 11, 12, 20 and 21: Number of vehicles x factor (para 4.9c) + time intervals in kilometers = kilometers.

Columns 13, 14 and 15: road space (coln 10) x 60 = TL (min).

speed (KPH)

Columns 16, 17, 22 and 23: Number of vehicles x factor (para 4.9d) + time intervals = TL (min).

Column 18: Number of men on foot (coln 9 ÷ 20 except to insure tactical integrity.

Column 18: Number of men on foot (coln 9 $\div$ 20 except to insure tactical integrity)



BASIC INFANTRY UNITS

BASIC ARMORED UNITS

BASIC MECHANIZED UNITS FM 101-10-1

Fold-in No. 4
(faces p. 4-54)

Organic vehicles Infantry Division (marching vehicles)	Quartering Party	Brigade trains	March column	Organic vehicles Infantry Division (marching vehicles)	Quartering Party	Brigade trains	March column	Organic vehicles Infantry Division (marching vehicles)	Quartering Party	Brigade trains	March column
Units of the Infantry Division are organized identical to those in the Armored Division with the following excep- tions:				TOTAL VEHICLES: ³ 4046/4070				Units of the Mechanized Division are organized identical to those in the Armored Division with the following excep- tions:			
TOTAL VEHICLES: ³ 3412/3436				HQ & HQ Co, armd div..	8	-----	37	TOTAL VEHICLES: ³ 3848/3872			
HQ & HQ co, inf div.....	8	-----	36	MP co.....	5	-----	49	HQ & HQ co, inf div	8	-----	37
HQ & HQ co, bde (3 ea)...	4	3	35	Avn bn.....	4	-----	67	(mech).			
Tk bn (2 ea).....	*	*	*	HQ & HQ det.....	(2)	-----	(17)	HQ & HQ co, bde (3 ea)...	4	5	36
Inf bn (8 ea).....	5	17	94	Avn co (GS).....	(1)	-----	(29)	Maint bn.....	9	144	123
HQ & HQ co.....	(2)	(14)	(70)	Air mbl co (lt).....	(1)	-----	(21)	HQ & main spt co.....	(4)	-----	(86)
Rifle co (3 ea).....	(1)	(1)	(8)	Sig bn.....	28	-----	161	Fwd spt co (3 ea).....	(1)	(48)	-----
Engr bn ¹	7	-----	239/263	HQ & HQ det.....	(2)	-----	(17)	Trans acft maint co.....	(2)	-----	(37)
HQ & HQ co.....	(2)	-----	(70)	Comd op co.....	(1)	-----	(41)	Tk bn (3 ea).....	*	*	*
Engr co (4 ea).....	(1)	-----	(28)	Fwd comm co ¹	(13)	(42)	(6)	Mech inf bn (7 ea).....	*	*	*
Brg co ¹	(1)	-----	(57/81)	Comd Tml Team ¹	(4)	-----	-----				
FA bn 105-mm (towed)	5	-----	116	(3 ea).							
(3 ea).				Fwd area sig cen		(14)	-----				
HQ, HQ & svc btry.....	(2)	-----	(56)	plat ¹ (3 ea).							
FA btry 105-mm (3 ea)...	(1)	-----	(20)	Sig spt op co ²	(4)	-----	(50)				
FA bn 155-mm/8-in.	6	-----	126	HQ & HQ co, bde (3 ea)...	4	5	36				
(towed).				Tk bn (6 ea).....	10	24	139				
HQ, HQ & svc btry.....	(2)	-----	(54)	HQ & HQ co.....	(4)	(21)	(76)				
FA btry 155-mm (3 ea)...	(1)	-----	(20)	Tk co (3 ea).....	(2)	(1)	(21)				
FA btry 8-in.....	(1)	-----	(12)	Mech inf bn (5 ea).....	10	21	131				
Sup & trans bn.....	3	-----	135	HQ & HQ co.....	(4)	(18)	(62)				
HQ & HQ co.....	(1)	-----	(16)	Mech rifle co (3 ea)....	(2)	(1)	(23)				
Sup & svc co.....	(1)	-----	(22)	Armd cav sqdn.....	6	27	173				
Trans mtr trans co.....	(1)	-----	(97)	HQ & HQ trp.....	(2)	(24)	(48)				
Maint bn.....	9	129	112	Armd cav trp (3 ea)....	(1)	(1)	(36)				
HQ & main spt co.....	(4)	-----	(75)	Air cav trp.....	(1)	-----	(17)				
Fwd spt co (3 ea).....	(1)	(43)	-----	Engr bn ³	7	-----	240/264				
Trans Acft maint co....	(2)	-----	(37)	HQ & HQ co.....	(2)	-----	(71)				
				Cbt engr co (4 ea).....	(1)	-----	(28)				
				Brg co ³	(1)	-----	(57/81)				
				HQ & HQ btry, div arty..	3	-----	61				
				FA bn 155-mm SP (3 ea)...	5	15	103				
				HQ, HQ & svc btry.....	(2)	(12)	(49)				
				FA btry 105-mm SP	(1)	(1)	(18)				
				(3 ea).							
				FA bn 155-mm/8-in. SP..	6	-----	130				
				HQ, HQ & svc btry.....	(2)	-----	(60)				
				FA btry 155-mm SP	(1)	-----	(16)				
				(3 ea).							
				FA btry 8-in.....	(1)	-----	(24)				
				FA bn, HJ.....	3	-----	82				
				HQ & HQ btry.....	(1)	-----	(38)				
				FA btry, HJ (2 ea).....	(1)	-----	(22)				
				HQ & HQ co & band spt	6	-----	13				
				comd.							
				Admin co.....	1	-----	23				
				Med bn.....	5	78	44				
				HQ & spt co.....	(2)	-----	(44)				
				Med co (3 ea).....	(1)	(26)	-----				
				Sup & trans bn.....	3	-----	145				
				HQ & HQ co.....	(1)	-----	(16)				
				Sup & svc co.....	(1)	-----	(22)				
				Trans mtr trans co.....	(1)	-----	(107)				
				Maint bn.....	9	144	126				
				HQ & main spt co.....	(4)	-----	(89)				
				Fwd spt co (3 ea).....	(1)	(48)	-----				
				Trans acft maint co....	(2)	-----	(37)				

¹ One fwd area Sig cen plat normally located in each bde trains area; one comd tml team in each bde CP.

² Provides Sig spt to div spt comd.

³ Left figure applies when brg co equipped with MAB, right figure when equipped with M4T6 bridging.

* Same as Armored Division.

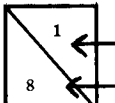
c. Characteristics of Rafts.

FM 101-10-1

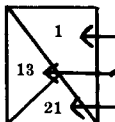
1		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		Type of raft	Personnel required		Type of power unit required ¹	Number of pontoons or floats and type of construction	Length		Capacity classes ²												Numbers of rafts from one set ⁴	Transportation for raft equipment	
									Normal crossings						Risk crossings								
			Stream velocities in feet per second (FPS)																				
			Erection	Operation			Overall with ramp ³	Loading space	3	5	7	8	9	11	3	5	7	8	9	11		Number	Type
2	Infantry support ⁵	1 platoon	1 squad	Outboard motors, 25 HP	3 reinforced	38' 0"	24' 0"	1	1	2	(6)			1	1	2	(6)	(6)		1	1	2½-ton cargo truck and pole trailer.	
					5 reinforced	50' 0"	35' 9"	1	2	3	(6)			1	2	3	(6)	(6)		0.6 or 0.7 W 1 M2 assault boat.	2		
					7 reinforced	62' 0"	47' 9"	1	2	4	(6)			1	2	4	(6)	(6)		0.43 or 0.5 W 1 assault boat.	2		
3	M4 ⁷ (Standard B).	1 platoon	1 squad	27' bridge erection boats ⁸	4 normal	87' 1"	51' 8"	1	1	1	1	2	3	1	1	1	1	2	3	4	5	2½-ton bolster truck and trailer.	
					6 reinforced			50	50	50	50	50	40	55	55	55	55	55	45	50	4		6
					7 reinforced			70	70	70	65	65	50	75	75	75	75	75	55	60	4		7
4	Class 60 (Standard B)	1 platoon	1 squad	27' bridge erection boats ⁸	4 normal	92' 5"	51' 0"	1	1	2	3	4	1	1	2	3	4	5	6	7	2	5-ton bridge truck.	
					5 normal	107' 5"	66' 0"	1	1	2	3	4	5	1	1	2	3	4	5	6	2		
					5 reinforced	92' 5"	51' 0"	55	55	50	55	45	35	60	60	60	60	55	45	50	2		
					6 reinforced	92' 5"	54' 0"	65	65	65	60	60	50	80	80	80	75	70	60	70	2		
5	M4T6	1 platoon	1 squad	27' bridge erection boats ⁸	4 normal	87' 1"	51' 8"	1	1	2	3	4	1	1	2	3	4	5	6	7	2	5-ton bridge truck.	
					4 reinforced	87' 1"	51' 8"	50	50	50	45	40	35	60	60	60	55	50	45	50	2		
					5 normal	102' 1"	66' 8"	1	1	2	3	3	5	1	1	2	3	3	5	6	1.67		
					5 reinforced	88' 9"	50' 1"	60	60	60	55	55	45	70	70	70	65	65	55	60	1.96		
6	Raft, light, tactical ⁹	1 platoon	1 squad and out-board ops	Outboard motor, 25 HP	4 pontoons reinforced ¹⁰	46' 10"	33' 0"	1	1	2	2	3		1	1	2	3	4	4	1	2	2½-ton lwb cargo truck and pole trailer.	
					6 pontoons reinforced ¹¹	69' 2"	55' 1"	1	1	2	3	3	12	4	1	1	2	3	3	12			4

LEGEND

Infantry Support Rafts Only

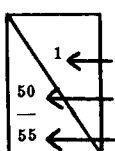


Number of power units required.
Single vehicle capacity.



Number of power units required.
Single vehicle capacity.
2 vehicle capacity, approximately equal in weight.

All Other Rafts



Number of power units required.
Upper figure is wheeled vehicle capacity.
Lower figure is tracked vehicle capacity.

Crossing characteristics	River width (feet)		
	250	500	1,000
Number of round trips per hour in 5 FPS current in daylight	6	4	2
Rafts operated from one site	1	2	3
Number of round trips per hour in 5 FPS current in blackout	3	2	1

¹ Although not shown on table, outboard motors can be used to advantage on all rafts in current velocities up to 5 FPS.

² Overall deck length, including overhang and ramps.

³ Capacities are based on loading rafts with center of gravity of loads 6" downstream from centerline of raft and on properly inflated floats.

⁴ Rafts and bridges are issued as sets by the appropriate supply manual.

⁵ Wheeled and tracked vehicles have the same ratings.

⁶ One 19' bridge erection boat per raft in currents of 8 and 9 FPS.

⁷ One 19' and two 27' boats may be used here rather than three 27' boats.

⁸ One 19' bridge erection boat may be used in currents not more than 4 FPS. In currents over 4 FPS, two 19' bridge erection boats may be substituted for one 27' bridge erection boat.

⁹ Three 19' bridge erection boats may be used here rather than two 27' boats.

¹⁰ Four pontoons beneath 3 treadways with 108" roadway. Articulator bays are not utilized.

¹¹ Six pontoons beneath 4 treadways with 108" roadway. Articulator bays are not utilized.

¹² Varies, depending on whether normal or articulator bays are used with ramp.

d. Characteristics of Standard Floating Bridges.

FM 101-10-1

Fold-in No. 6 (faces p. 4-114(2)) No. 6

1		2		3	4	5	6	7		8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27			
1	Type of bridge		Transportation required ¹	Construction time in hours ²				Construction party ³	Main-tenance crew	Capacity in tons ⁴																		Traffic capacity and vehicular distance for safe crossings in daylight (except as otherwise noted) ⁵				
				Stream widths						Normal crossing (posted capacity) ⁵									Caution crossing ⁶										Risk crossing ⁷			
										Stream velocities in feet per second (FPS)																						
										150 ft	250 ft	500 ft	1,000 ft	3	5	7	8	9	11	3	5	7	8	9	11	3	5		7	8	9	11
2	Footbridge, aluminum, floating.		3 2½-ton trucks or 2 2½-ton trucks W 2½-ton trailers per 472-ft 6-in. bridge.	(⁹) 2¾	(⁹) 4½	(⁹) 9	-----	1 plat	1 sqd	Safe	-----	-----	(¹⁰)	(¹⁰)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	Day: 75 men per minute. Night: 40 men per minute (moonlight); 25 men per minute (blackout) at normal 2-pace distance. ¹¹			
3	M2 assault boat bridge.	Normal construction.	1 2½-ton truck W 1 pole tlr per 36 ft of bridge.	1	1½	2½	-----	1 plat	1 sqd	8	6	5	-----	-----	-----	8	6	5	-----	-----	-----	9	7	6	-----	-----	-----	-----	200 vehicles per hour; 90-ft distance between vehicles.			
4		Reinforced construction.	1 2½-ton truck W 1 pole tlr per 24 ft of bridge.	1½	2	3	-----	1 plat	1 sqd	13	9	7	-----	-----	-----	13	11	8	-----	-----	-----	14	12	9	-----	-----	-----	-----				
5	M4 floating bridge. (Standard B)		1 5-ton bridge truck per 15 ft of bridge (normal construction).	3	5	8	14	1 ponton brg co plus 1 or 2 cmbt co.	1 sqd	¹² (60) 60	(60) 60	(45) 50	(40) 45	(30) 35	(18) 20	(68) 68	(65) 65	(58) 59	(52) 53	(44) 46	(29) 31	(72) 72	(68) 68	(61) 62	(58) 59	(53) 54	(37) 39	400 vehicles per hour. See footnotes 5, 6, and 7.				
										(100) 100	(100) 100	(100) 100	(85) 85	(70) 70	(35) 40	(105) 105	(105) 105	(105) 105	(95) 95	(85) 85	(55) 55	(110) 110	(110) 110	(110) 110	(105) 105	(100) 100	(70) 70					
6	Class 60 floating bridge. (Standard B)		1 5-ton bridge truck per 15 ft of bridge.	1½	2½	4½	8½	1 float brg co plus 1 or 2 cmbt co.	1 sqd	¹³ (60) 65	(55) 65	(45) 55	(40) 50	(35) 45	(22) 25	(65) 70	(62) 67	(56) 61	(52) 56	(45) 49	(34) 37	(75) 79	(72) 77	(67) 72	(62) 67	(57) 62	(46) 50	400 vehicles per hour. See footnotes 5, 6, and 7.*				
7	M4T6 floating bridge.		1 5-ton bridge truck per 15 ft of bridge.	2	3	5	10	1 float brg co plus 1 or 2 cmbt co.	1 sqd	(50) 55	(45) 55	(40) 50	(35) 45	(30) 40	(25) 30	(60) 61	(58) 59	(54) 55	(49) 51	(45) 47	(35) 37	(68) 69	(66) 67	(62) 63	(59) 60	(54) 56	(43) 45					
8	Light tactical bridge. ¹⁴		2 2½-ton LWB cargo trucks W 2½-ton pole tlr per 33 ft of bridge.	1	1½	2½	-----	1 plat	1 sqd	16	16	13	11	8	2	18	18	15	12	9	3	21	21	17	14	11	5	200 vehicles per hour. See footnote 14.				

¹ Transportation for bridge equipment only. Additional needed for any construction equipment required and for troops.

² Includes unloading and construction only in daylight. Does not include access roads, assembly sites, abutments, or anchorages, except as noted.

³ Average for trained troops and continuous daylight construction. Allowances are required for specific situations.

⁴ Based on abutments at levels within 12" of floating bridge deck level.

⁵ Vehicle anywhere on width of bridge deck. Speeds 3-15 MPH for wheeled vehicles, 2-8 MPH for tracked vehicles. Vehicle spacing as dictated by tactical commander. Minimum spacing 90'.

⁶ Center of vehicle within 12" of bridge centerline. Maximum speed 8 MPH for wheeled vehicles, 5 MPH for tracked vehicles. Minimum spacing 150'; no sudden stopping, accelerating, or gear shifting.

⁷ Center of vehicle within 9" of centerline and with guide. Maximum speed 3 MPH. One vehicle on bridge. No stopping, braking, or gear shifting.

⁸ Traffic capacities are for all traffic moving forward or rearward.

⁹ This time does not include installation of the anchorage system.

¹⁰ In currents above 8 FPS, the capacities are reduced 20 percent.

¹¹ Decrease capacities by 20 percent in currents over 8 FPS. Capacities are based on minimum interval of 5' between men or 2 or less men per bay.

¹² Upper figures in parentheses represent normal construction and lower figures represent reinforced construction.

¹³ Upper figures in parentheses represent wheeled load class and lower figures represent tracked load class.

¹⁴ Capacities for light tactical bridge are based on a 108" roadway with an 18' reinforced end span without articulator bays.

f. Characteristics of Fixed Highway Bridges.¹ (fig. 4-24).

FM 101-10-1

(faces p. 4-114(3) No. 7 Fold-in No. 7

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
1	Type T6 (width 13' 6")				Panel bridges																					Beam bridges ²				Truss and girder bridges ²		
2					Bailey types, M2																					I-beam stringers ³		WF beam stringers ⁴		Truss ⁵		Girder ⁶
3					Single-single			Double-single			Triple-single			Double-double			Triple-double			Double-triple			Triple-triple			30' span ⁵	60' span ⁵	27" depth ⁶	36" depth ⁶	90' span ⁵	68" depth ⁶	
					H	C	R	H	C	R	H	C	R	H	C	R	H	C	R	H	C	R	H	C	R							
4	30				30	42	47																									
5	40				24	36	40																					100				
6	50				24	33	36	75	83	88																						
7	60				20	30	33	65	77	85																						
8	70				20	24	30	60	68	78																						
9	80				16	20	24	50	60	66	85	95	100													50	50		100	50		
10	90				12	16	19	40	50	55	65	74	82																			
11	100				8	12	14	30	37	42	50	57	64	80	86	96																
12	105	95	100																													
13	110							20	30	34	35	47	52	65	72	80	90	100	100													100
14	120	70						16	23	27	30	38	43	45	57	64	75	83	90	91												
15	130							12	18	21	20	31	35	35	47	53	55	60	72	80	90											
16	135	60																														
17	140							8	14	17	16	24	29	30	39	44	45	57	64	70	80	88										
18	150	45	105								12	18	22	24	32	36	35	47	54	60	77	85										
19	160										8	15	17	16	25	30	30	37	45	55	69	80	80	100	100							
20	165	35	85																													
21	170										4	10	13	12	19	24	20	31	36	45	57	64	70	80	90							
22	180		75											8	15	18	16	24	29	35	48	55	55	66	77							
23	190																12	18	22	30	39	46	45	59	68							
24	195		65	110																												
25	200																															
26	210		55	90																												
27	225																															
28	240																															
29	255																															

¹ Upper figure represents wheeled load class; lower figure represents tracked load class.

² Dual classification data are not available.

³ With one line of traffic.

Example:

46
51

⁴ 22' roadway.

⁵ Length of one unit.

⁶ Depth of beam or girder.

⁷ Limited by roadway width.

Figure 4-24

g. Characteristics of Railway Bridge Equipment (fig. 4-25).

(faces p. 4-114(4) No. 8 Fold-in No. 8

1		2	3	4	5	6	7	8	9	10			
Type of bridge		Bridge sets		Shipping data ¹		Maximum speed at Cooper's E-45 loading (MPH)	Construction effort in man-hours ⁴	Erection equipment ⁵		Steel trestle units ⁶			
		Procurement ²	Theater issue ²	Weight (STON)	Cubage (MTON)			Special sets	Components				
2	Through truss	123' span	92'3" span			40	No data	Special set for spans 92'3" to 123'	Lowering frames, erection derrick, miscellaneous equipment, equipment for special methods.	T-type: piers 2'8"-70'8" in 1'4" increments. For bridge seatings, see TM 5-374.			
			102'6" span			40							
			112'6" span			40							
			123'0" span	133.66	131.00	40	7,200						
			133'3" span			40	No data						
			143'6" span			20	9,000						
		153'9" span			10	No data							
		Set A—(end posts from sloped to vertical)		1.68	0.50	NA	NA	Special set consisting of erection frame and erection gantry					
		Set B—(end posts from square to skew)	Set B	1.77	1.34								
		Set C—(connect two spans with sloped end posts)	Set C	0.18	0.14								
		Set D—(connect two spans with vertical end posts)	Set D	0.27	0.20								
		Set K—(lengthen span to 153'9")	Set K	38.84	31.78								
Wide-flange beam	27"	22' span (2 beams)	No data	6.10	4.80				40	100	None	No data	Various
		34' span (4 beams)		14.40	12.30	150							
		40' span (6 beams)		19.00	16.60	210							
	36"	35' span (2 beams)		12.40	10.50	40	170						
		45' span (4 beams)		28.40	24.70		470						
		57' span (6 beams)		39.90	35.00		540						
Plate girder, 48"	56' span (2 girders)		31.50	24.10	40	370							
	80' span (4 girders)		66.90	51.80		660							
	100' span (6 girders)		117.50	88.60		1,200							
5	I-beam ⁷	17' span (four 18" girders)	17' span	2.55	1.67	25	100-400	None	Erection gantry, erection derrick, equipment for special methods, miscellaneous equipment.	L-type: piers in heights from 3'-93" in 6" increments. For bridge seatings, see TM 5-374.			
		21' span (six 18" girders)	21' span	4.32	4.00	40							
		27' span (four 24" girders)	27' span	5.70	5.10	25							
		31' span (six 24" girders)	31' span	9.33	8.49	40							
		35' span (six 24" girders)	35' span	10.40	9.56	40							
		Set I—(splice one 24" I-beam)	Set I	0.10	0.04	NA							
		Set J—(splice one 18" I-beam)	Set J	0.07	0.04								
		Unit construction	Deck-type	70' span, deck, two-girder	70'						72.66	44.93	40
70' spans with set F	85'			145.32	89.86	40	1,600						
Set F—material required in addition to material in two 2-girder 70' spans to construct one 3-girder 85' span. ⁸				5.15	1.59	NA	NA						
Through-type	70' span, through, two-girder ⁹		70'	48.68	33.02	40	1,220						
	85' span, through, four-girder		85'	96.00	70.00	40	1,560						
	Set E—used to convert 70' 2-girder through-type to 70' 2-girder deck-type.			1.89	0.62	NA	NA						
	Set G—used to connect two 70' through-type spans.		Set G	0.23	0.20								
	Set H—(convert square to skew ends)		Set H	3.14	2.70								

¹ These bridge sets for specific span lengths, and conversion sets to change or supplement a bridge set, are procured and furnished to theater of operations.

² Theaters make up these bridge sets for specific span lengths from stocks of components furnished in the procurement sets. Conversion sets to change truss construction (A, E, F) are used in assembling the theater sets. The other conversion sets are issued for use by the constructing unit. For special construction, components are issued rather than sets. See TB ENG 56 for detailed information.

³ The shipping data are the weight of the crated set.

⁴ Tentative. Figure is computed from the arrival of equipment on the site and includes unloading and construction. For night, increase by 50 percent. Time for erection of piers, approaches, and approach spans is not included. Bridge truck is a separate facility.

⁵ The theater is furnished a supply of basic sets of railway bridge erection equipment. This equipment is issued to units constructing railway bridges in special sets, made up of the items required to construct a specified length and configuration of bridge. Other standard items of erection equipment are furnished to constructing units by component, depending on the type of bridge and the construction conditions.

⁶ The light standard (L-type) and standard (T-type) trestles are furnished to the theater and to the field as components.

⁷ The I-beam span sets will assemble either square or skewed with the exception of the 17' and 21' spans, which require an extra L-6 member for skewed assembly.

⁸ Special sets are available for spans from 50'—85' in 5' increments in deck girders and 55'—85' in 5' increments in through girders.

Figure 4-25

(1) Characteristics of personnel and individual weapons emplacements.

(faces p. 4-116①) No. 9

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1	Type of emplacement or shelter	Protection afforded ¹							Total construction time in man-hours for construction with D-handle shovels and ordinary carpentry tools ⁴					Weight and volume of materials								
		Nuclear weapons effects ²				Conventional weapons effects ³								Revetment materials for cover support only				Complete revetment				
		Nuclear radiation transmission factors			Fortification protection factor	Thermal effects	Tracked vehicles	Artillery fragments	Revetment materials for cover support only		Complete revetment		No revetment materials used	Corrugated metal construction ⁶		Sized lumber construction		Corrugated metal construction ⁶		Sized lumber construction		
		Initial gamma	Initial neutron	Residual gamma ⁵					Corrugated metal const	Sized lumber const	Corrugated metal const	Sized lumber const		Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Volume (cu ft)	Weight (lb)	
2	Improved crater.....	0.6	0.8	0.3	90	Fair	Virtually none	Better than in open	NA	NA	NA	NA	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	Skirmishers trench.....	0.8	0.9	0.5	95	Fair	Virtually none	Better than in open	NA	NA	NA	NA	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
4	Prone emplacement.....	0.4	0.7	0.2	85	Good	Virtually none	Fair	NA	NA	NA	NA	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	Open one-man foxhole.....	0.09	0.3	0.1	65	Very good	Good	Good	NA	NA	3.5	4.5	2.0	NA	NA	NA	NA	190	3.5	240	8	
6	Open one-man foxhole with offset.....	0.004	0.008	0.00001	20	Excellent	Very good	Excellent	9.0	14.0	10.0	16.0	NA	50	0.6	180	5.5	240	4.0	420	13.0	
7	One-man foxhole with half cover.....	0.08	0.2	0.04	55	Very good	Fair (—)	Very good	2.5	3.0	4.5	5.5	NA	10	0.1	20	0.6	200	3.5	260	8.0	
8	One-man foxhole with half cover and offset.	0.003	0.003	0.00001	20	Excellent	Very good	Excellent	10.0	14.0	12.0	18.0	NA	60	0.7	200	6.0	250	4.0	440	14.0	
9	Open two-man foxhole.....	0.1	0.3	0.1	65	Good	Good	Good	NA	NA	6.0	8.0	3.0	NA	NA	NA	NA	280	5.0	320	10.0	
10	Deepened two-man foxhole.....	0.07	0.15	0.1	55	Very good	Good	Very good	NA	NA	8.0	10.0	5.0	NA	NA	NA	NA	300	5.5	375	12.0	
11	Two-man foxhole with half cover.....	0.09	0.2	0.04	60	Very good	Fair to good	Very good	4.0	4.0	8.0	10.0	NA	15	0.2	32	1.0	280	5.0	350	11.0	
12	Two-man foxhole with half cover and two offsets.	0.002	0.003	0.00001	15	Excellent	Very good	Excellent.	20.0	30.0	22.0	35.0	NA	120	1.5	400	12.0	380	6.0	700	22.0	
13	Two-man foxhole with half cover and adjoining shelter.	0.01	0.02	0.0005	30	Excellent	Good	Excellent	11.0	17.0	13.0	22.0	NA	100	1.2	560	18.0	460	7.0	880	28.0	
14	Open fighting trench (25' length) ⁶	0.4	0.7	0.3	85	Good	Fair	Fair	NA	NA	28.0	32.0	21.0	NA	NA	NA	NA	490	8.0	710	22.0	
15	Fighting trench with full cover (25' length).	0.15	0.4	0.03	70	Excellent	Fair	Very good	27.0	29.0	35.0	40.0	NA	240	4.0	360	11.0	730	12.0	1,060	33.0	

¹ Protection afforded assumes the occupants of fortifications are in the most protected position of their fortifications. For most fortifications, protection decreases as the angle of sight from the position to the center of the weapon burst increases.

² For blast effects, see FM 5-15, paragraph 16.

³ a. For direct fire weapons effects, see FM 5-15, paragraph 9.

b. For close combat weapons effects, see FM 5-15, paragraph 7.

⁴ Assume normal digging capability in daylight with trained troops.

⁵ Assumes fallout is kept out of hole at surface level by some sort of cover.

⁶ May include wooden framing and braces.

Note. Classification of Fortification by Attenuating of Residual Radiation.

a. Fortifications may be generally classified according to their attenuation of residual radiation. Such classification is shown below:

Fallout Attenuation Classifications

Transmission factors	Classification	General guidance in high-level radiation field
Less than 0.001.....	Excellent.....	Remain in place.
0.001 to 0.005.....	Good.....	Probably remain in place.
0.005 to 0.01.....	Fair.....	Probably leave position at optimum time.
More than 0.01.....	Poor.....	Leave position at optimum time.

b. A general idea of the dose to be expected with the classifications shown above is tabulated below, using a fallout arrival time of H + 1 and a stay time of 96 hours. Under these conditions, the total incident dose in rad is exactly three times the dose rate of H + 1. Assuming an H + 1 dose of 5,000 rad/hour:

Interior Dose for Various Fallout Classification*

Classification	Total dose
Excellent.....	Less than 15 rad*
Good.....	15 to 75 rad*
Fair.....	75 to 150 rad*
Poor.....	More than 150 rad*

* See conditions in FM 5-15, appendix II, on fortification protection factor.

(2) Characteristics of crew-served infantry and artillery weapons emplacements.

(faces p. 4-116(2) No. 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	Type of emplacement or shelter	Protection afforded ¹							Total construction time in man-hours for construction with D-handle shovels and ordinary carpentry tools ⁴					Weight and volume of materials							
		Nuclear weapons effects ²				Conventional weapons effects ³								Revetment materials for cover support only				Complete revetment			
		Nuclear radiation transmission factors			Fortification protection factor	Thermal effects	Tracked vehicles	Artillery fragments	Revetment materials for cover support only		Complete revetment	No revetment materials used	Corrugated metal construction ⁵		Sized lumber construction		Corrugated metal construction ⁵		Sized lumber construction		
		Initial gamma	Initial neutron	Residual gamma ⁵					Corrugated metal coat	Sized lumber const			Corrugated metal coat	Sized lumber const	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Volume (cu ft)
CHARACTERISTICS of CREW-SERVED WEAPONS EMPLACEMENTS																					
2	Open automatic rifle emplacement.....	0.1	0.3	0.1	65	Very good	Good	Fair	NA	NA	7.0	8.0	4.0	NA	NA	NA	NA	170	3.0	200	6.0
3	Automatic rifle emplacement with 18" of cover.	0.07	0.2	0.02	55	Very good	Virtually none	Good	4.0	5.0	6.0	7.0	NA	45	0.5	70	2.0	220	4.0	270	10.0
4	Open horseshoe-type machinegun emplacement.	0.15	0.4	0.1	70	Good	Fair	Fair to good	NA	NA	5.0	7.0	2.0	NA	NA	NA	NA	280	5.0	450	14.0
5	Open two 1-man foxhole-type light machinegun emplacement.	0.1	0.3	0.1	65	Very good	Good	Good	NA	NA	6.0	7.0	4.0	NA	NA	NA	NA	530	10.0	640	20.0
6	Horseshoe-type light machinegun emplacement with full cover.	0.06	0.2	0.003	55	Very good	Fair	Very good	9.0	11.0	11.0	14.0	NA	190	4.0	250	7.0	720	13.0	890	27.0
7	Two 1-man foxhole-type light machinegun-type emplacement with 1/2 cover and adjoining shelter.	0.015	0.03	0.0005	30	Excellent	Good	Excellent	15.0	22.0	19.0	28.0	NA	250	2.5	630	20.0	520	7.5	850	30.0
8	Circular-type .50 cal machinegun emplacement.	0.3	0.5	0.15	80	Fair	Fair	Fair	NA	NA	14.5	16.5	10.0	NA	NA	NA	NA	300	5.0	420	13.0
9	Pit-type emplacement for 3.5-inch rocket launcher.	0.3	0.5	0.15	80	Fair	Fair	Fair	NA	NA	5.0	6.0	3.0	NA	NA	NA	NA	110	1.0	160	5.0
10	81-mm mortar emplacement.....	0.4	0.7	0.3	85	Good	Virtually none	Fair	NA	NA	12.0	NA	NA	NA	NA	NA	NA	210	3.0	NA	NA
11	4.2-inch mortar emplacement.....	0.4	0.7	0.3	85	Good	Virtually none	Fair	NA	NA	29.0	NA	NA	NA	NA	NA	NA	370	6.0	NA	NA
12	Recoilless rifle position (mounted).....	0.4	0.6	0.2	80	Fair	Virtually none	Fair	NA	NA	NA	NA	30.0	NA	NA	NA	NA	NA	NA	NA	NA
13	Recoilless rifle position (dismounted).....	0.5	0.7	0.2	85	Fair	Virtually none	Fair	NA	NA	NA	NA	17.0	NA	NA	NA	NA	NA	NA	NA	NA
CHARACTERISTICS of ARTILLERY WEAPONS EMPLACEMENTS																					
14	105-mm howitzer emplacement.....	0.6	0.8	0.6	90	Good	Virtually none	Fair	NA	NA	NA	NA	100.0	NA	NA	NA	NA	NA	NA	NA	NA
15	155-mm howitzer emplacement.....	0.6	0.8	0.6	90	Good	Virtually none	Fair	NA	NA	NA	NA	170.0	NA	NA	NA	NA	NA	NA	NA	NA

¹ Protection afforded assumes the occupants of fortifications are in the most protected position of their fortifications. For most fortifications, protection decreases as the angle of sight from the position to the center of the weapon burst increases.

² For blast effects, see FM 5-15, paragraph 15.

³ a. For direct fire weapons effects, see FM 5-15, paragraph 9.

b. For close combat weapons effects, see FM 5-15, paragraph 7.

⁴ Assumes normal digging capability in daylight with trained troops.

⁵ Assumes fallout is kept out of hole at surface level by some sort of cover.

⁶ May include wooden framing and braces.

Note. Classification of Fortifications by Attenuating of Residual Radiation.

a. Fortification may be generally classified according to their attenuation of residual radiation. Such classification is shown below:

Fallout Attenuation Classifications

Transmission factors	Classification	General guidance in high-level radiation field
Less than 0.001.....	Excellent.....	Remain in place.
0.001 to 0.005.....	Good.....	Probably remain in place.
0.005 to 0.01.....	Fair.....	Probably leave position at optimum time.
More than 0.01.....	Poor.....	Leave position at optimum time.

b. A general idea of the dose to be expected with the classification shown above is tabulated below, using a fallout arrival time of H + 1 and a stay time of 95 hours. Under these conditions, the total incident dose in rad is exactly three times the dose rate of H + 1. Assuming an H + 1 dose of 5,000 rad hour:

Interior Dose for Various Fallout Classifications*

Classification	Total dose
Excellent.....	Less than 15 rad*
Good.....	15 to 75 rad*
Fair.....	75 to 150 rad*
Poor.....	More than 150 rad*

* See conditions in FM 5-15, appendix II, on fortification protection factor.

5-24. Gasoline and Oil Supply Data—Selected Service Units^{1,2}

(faces p. 5-48) No. 11

1	2	3	4	5	6	7	8	9	10	11	12
Unit	Fuel and lubricant requirements motor vehicle/aircraft Consumption in moving Unit 160 km/ 100-miles				Gasoline capacity (gal)			Fuel can data number of organic fuel cans			Organic kitchens
	Vehicle/ aircraft fuel (gal)	Engine oil (gal)	Gear lubricant (lb)	Grease miscel- laneous (lb)	Vehicle/ aircraft tanks	Vehicle cans, 5-gal	Total ve- hicle/ air- craft tanks vehicle cans, 5 gal	Resupply, kitchens, airplanes, and miscel- laneous	Motor Vehicles	Total miscel- laneous and motor vehicles	
2 Engr dump trk co.....	2,050/	31.9/	61.4/	41.6/	3,180/	695	3,875	16	123	139	1
3 Engr PNLBRG co.....	1,090/	23.4/	43.4/	23.6/	2,340/	1,875	4,215	37	388	375	1
4 Engr float brg co.....	2,525/	54.1/	63.6/	58.0/	4,840/	315	5,155	7	56	63	1
5 Engr topo bn, army.....	978/	11.6/	15.7/	12.5/	2,270/	805	3,075	44	117	161	3
6 HQ & HQ co.....	(342)/	(3.9)/	(5.5)/	(4.0)/	(708)/	(325)	(1,033)	(19)	(46)	(65)	(1)
7 Engr map repro and distr co, army.....	(458)/	(5.7)/	(7.8)/	(6.5)/	(1,124)/	(340)	(1,464)	(16)	(52)	(68)	(1)
8 Engr photomapping co, army.....	(178)/	(2.0)/	(2.4)/	(2.0)/	(438)/	(140)	(578)	(9)	(19)	(28)	(1)
9 Engr topo co, corps.....	398/	5.2/	7.3/	6.0/	972/	345	1,317	23	45	68	1
10 Med amb co.....	455/	11.0/	12.2/	11.0/	1,080/	370	1,450	4	70	74	1
11 Military police bn, army.....	1,130.7/	29.2/	34.5/	29.7/	2,709/	755	3,464	159	151	310	4
12 HQ & HQ det, MP bn.....	(147.9)	(3.4)	(4.8)	(3.6)	(351)	(95)	(446)	(15)	(19)	(34)	(1)
13 MP co.....	(327.6)	(8.6)	(9.9)	(8.7)	(786)	(220)	(1,006)	(48)	(44)	(92)	(1)
14 HQ & HQ det, QM gp.....	69/	0.1/	0.2/	0.1/	168/	75	243	7	8	15	1
15 Corps sig bn.....	3,954	80	147	84	9,586	2,200	11,786			440	3
16 HQ & HQ co.....	(361)	(8)	(12)	(8)	(861)	(205)	(1,066)			41	(1)
17 Comd op co.....	(1,279)	(26)	(47)	(28)	(3,087)	(735)	(3,822)			147	(1)
18 Fld op co.....	(2,313)	(46)	(88)	(48)	(5,638)	(1,260)	(6,898)			252	(1)
19 Trans amph trk co.....	915/	28.9/	43.0/	17.9/	2,100/	580	2,680	9	107	116	1
20 Trans lt trk co (2½-ton).....	1,150/	25.0/	50.0/	25.0/	3,690/	765	4,455	16	137	153	1
21 Trans lt trk co (5-ton).....	2,413.5/	51.8/	59.4/	51.8	5,093/	1,285	6,378	16	257	273	1
22 Trans med trk co.....	2,160/	40.0/	55.0/	50.0/	6,930/	735	7,665	13	134	147	1
23 Trans hv trk co.....	2,570/	40.0/	25.0/	30.0/	3,000/	1,345	4,345	9	260	269	1
24 Trans cgo carr co (tracked).....	1,620/	120.0/	45.0/	80.0/	3,240/	2,730	5,970	6	540	546	1
25 Trans carr co.....	700/	15.0/	15.0/	15.0/	1,450/	520	1,970	11	93	104	1
26 HQ & HQ det, trans trk bn.....	75/	1.0/	1.0/	1.0/	235/	130	365	13	13	26	1
27 HQ & HQ det, trans trk gp.....	120/	2.0/	2.0/	2.0/	290/	115	405	8	15	23	1
28 HQ & HQ co, trans hwy trans- port comd.....	110/	3.0/	3.0/	3.0/	300/	155	455	9	22	31	1
29 HQ & HQ det, trans transport acft bn.....	171/98	3.8/2.2	5.0/0.3	4.2/0.3	395/224	345	964	46	23	69	1
30 Trans lt hel co.....	328/1,750	6.4/20.8	10.1/6.2	6.6/4.2	781/5,226	445	6,452	40	49	89	1
31 Trans med hel co.....	376/4,370	7.2/85.6	12.0/9.8	7.3/6.6	908/6,582	440	7,930	36	52	88	1
32 HQ & HQ det, trans Army acft maint and sup gp.....	284/	5.6/	9.0/	6.2/	672/	280	952	22	34	56	1
33 HQ & HQ det, trans Army acft maint and sup bn.....	145/	3.0/	4.5/	3.3/	342/	175	517	17	18	35	
34 Trans Army acft maint and sup co, DS.....	757/88	15.6/2.3	14.7/	12.5/0.1	1,735/253	525	2,513	20	85	105	1
35 Trans Army acft maint and sup co, med cgo acft.....	819/	16.4/	16.7/	13.8/	1,925/	550	2,475	23	87	110	1
36 Trans Army acft maint and sup co, lt cgo acft.....	708/	14.4/	15.9/	11.7/	1,619/	510	2,129	23	79	102	1
37 Trans Army acft sup co, GS.....	460/	9.2/	10.9/	8.0/	1,107/	345	1,452	18	51	69	1
38 Trans Army acft maint co, air- plane, GS.....	419/	8.6/	9.2/	7.0/	953/	350	1,303	23	47	70	1
39 Trans Army acft maint co, hel, GS.....	468/	9.6/	9.9/	7.8/	1,055/	380	1,435	23	53	76	1

¹ Average daily gasoline consumption (net) is 15 gal per kitchen.² When a divider (/) is used in cols 2-6, figures left of the divider give vehicular data, while figures to the right pertain to aircraft.

5-31. Combat Vehicle Ammunition Data

(faces p. 5-50) No. 12

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Armament				Miscellaneous stowage ¹				Rounds per vehicle			Ammunition						
1	Combat vehicle	Principal	MG, cal .30/7.62-mm GP M60	MG cal .50	Grenades per vehicle	Flares, signal, ground, per vehicle	Miscellaneous per vehicle	Principal weapons	MG, cal .30/7.62-mm GP M60	SMG, cal .45	MG, cal .50	Ammunition stowage (in rounds per vehicle)				Rounds per vehicle in trains		
												Principal weapons	MG, cal .30/7.62-mm, GP, M60	SMG, cal .45	MG, cal .50	Principal weapon	MG, cal .30/7.62-mm, GP, M60	MG, cal .50
2	Armt subsystem, helicopter, 7.62-mm XM2.		2						6,500				1,300				5,200	
3	Armt subsystem, hel, 7.62-mm XM3.	2.75 in. rocket.						192				48				144		
4	Armt subsystem, hel, 7.62-mm quad, M6.		4						21,600				7,200				14,400	
5	Armt subsystem, hel, SS11, M22.	SS11 msl						36				6				30		
6	Carrier, pers, full-tracked, armed, M59.			1						180	1,800			180	1,800			
7	Carrier, pers, full-tracked, armd, M113.			1	20 hand	12	Rkt, 3.5-in., 10 rd.			180	2,100			180	2,000			
8	Carrier, comd and rcn, M114.		1	1	20	12			3,520		1,400		2,640		1,000		880	400
9	Combt engr veh T118.	165-mm DM1 gun	1	1	8			30	600		2,000	30	3,000		600			
10	Gun, twin 40-mm, SP, full-tracked M42A1.	40-mm gun (twin).	1		8 hand		Rkt, 3.5-in., 4 rd.	720	2,000			480	1,750		240			250
11	Gun, 90-mm, SP, full-tracked, M56.	90-mm gun			8 hand			29				29						
12	Howitzer, 105-mm, SP, full-tracked, M52A1.	105-mm gun		1	8 smoke or frag.			250		180	1,100	105		180	900	145		200
13	Howitzer, 155-mm, SP, full-tracked, M109.	155-mm how.		1	8 hand			150			600	28			500	122		100
14	Howitzer, 8-in., SP full-tracked, M110.	8-in. how			8 hand			150				2			500	148		
15	Launcher, 762-mm, rkt, M289.	762-mm rkt						5				1				4		
16	Mortar, 107-mm, SP, full-tracked, M84.	107-mm mort.	1	1	12 hand			163		180	2,000	93	3,000	180	600	70		1,400
17	Mortar, SP, 81-mm T257E1.	81-mm mortar.		1	12			155			2,000	120			600	35		1,400
18	Recovery veh, lt, M578.			1	8	16					600				500			100
19	Tk, cmbt, full-tracked, 76-mm gun, M41A3.	76-mm gun	1	1	8 hand	12		70	6,000	180	700	65	5,000	180	620	5	1,000	100
20	Tk, cmbt, full-tracked, 90-mm gun, M48A2.	90-mm gun	1	1				77	6,500		630	64	5,950		1,365	13	550	
21	Tk, cmbt, full-tracked, 105-mm gun, M60.	105-mm gun.	1	1	8 hand	12		78	6,500	360	1,260	63	5,000	360	900	15	1,500	360
22	Tk, cmbt, full-tracked, 120-mm gun, M103A1.	120-mm gun.	2	1				43	8,850	300	525	38	5,240	300	1,000	5	3,610	
23	Tk, recovery vehicle hv, M51.		1	1	20 hand		Rkt, 3.5-in., 6 rd; 6 pot smoke.		540	180	1,815		540	180	1,500			315
24	Tk, recovery vehicle, med, M74.		1	1	8 hand	16	Rkt, 3.5-in., 6 rd; 6 pot smoke.		2,000		1,680		2,000		1,050			630
25	Tk, recovery veh, medium, M88.			1	8 hand	16					1,600				1,500			100

¹ Included in basic load.

Fold-in No. 13 (faces p. 4-42)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A. AIRCRAFT	UNIT	O-1A, E OBSERVATION	OV-1A OBSERVATION	OV-1B OBSERVATION	OV-1C OBSERVATION	U-1A UTILITY	U-6A UTILITY	U-80 UTILITY	U-8F UTILITY	CV-2B CARGO	OH-13N OBSERVATION	OH-230 OBSERVATION	UH-1A UTILITY	UH-1B ⁴ UTILITY	UH-1D ⁶ UTILITY	UH-19D UTILITY	CH-21C CARGO	CH-14C CARGO	CH-17B CARGO	CH-47A ¹ CARGO	CH-54 ¹ CARGO
B. CREW (200 Lbs Ea)	Ea	1	2	2	2	1	1	1	1	3	1	1	1	1	1	1	2	2	3	1	2
C. DIMENSIONS																					
(1) Length - Fuselage	Ft & In	25'9 1/2"	41'0"	48'	41'0"	41'10"	30'5"	31'6"	33'3"	72'7"	30'5"	28'6"	39'6"	39'6"	40'1 1/2"	42'3"	52'7"	46'9"	64'11"	51'0"	70'3"
(2) Length - Blades Unfolded	Ft 6 In	NA	NA	NA	NA	NA	NA	NA	NA	NA	41'5"	40'8"	52'10"	52'11"	53'1"	62'3"	86'4"	65'10"	89'0"	98'1.25"	88'
(3) Length - Blades Folded	Ft 6 In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	42'3"	52'7"	37'0"	55'8"	51'0"	70'3"
(4) Width - Blades Folded	Ft 6 In	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11'7"	14'0"	13'0"	27'4"	12'5"	21'10"
(5) Width - Tread	Ft 6 In	7'7"	9'2"	9'2"	9'2"	11'2"	10'2"	12'10"	12'9"	23'2"	8'10"	7'6"	8'4"	8'4"	8'6"	11'0"	13'4"	12'0"	19'9"	11'11"	19'9"
(6) Height Extreme	Ft 6 In	7'6"	13'	13'	13'	12'5"	10'5"	11'6"	14'2"	31'9"	9'6"	10'2"	11'5"	14'4"	13'1"	15'3"	15'9"	15'11"	22'0"	19'	24'10"
(7) Diameter Main Rotor	Ft 6 In	NA	NA	NA	NA	NA	NA	NA	NA	NA	35'2"	35'5"	43'9"	44'0"	44'3"	53'0"	44'0"	56'0"	72'0"	59'1.25"	72'
(8) Diameter Tail Rotor	Ft 6 In	NA	NA	NA	NA	NA	NA	NA	NA	NA	5'8"	5'6"	8'5"	8'6"	8'6"	8'9"	NA	9'6"	15'0"	NA	15'8"
(9) Wing Span	Ft 6 In	36'0"	42'0"	42'0"	42'0"	58'0"	48'0"	45'4"	45'9"	95'7 1/2"	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D. CARGO DOOR																					
(1) Dimensions - Width/Height	In	45" x 33"	NA	NA	NA	46" x 45" Left	40" x 40"	35" x 36.5"	50 1/2" x 26 1/2"	73 1/2" x 74"	NA	NA	48" x 48"	48" x 48"	92" x 49"	48" x 48"	45" x 59"	53" x 48"	Hoec 87x72 Right 72" x 48"	90" Wide 78" High	NA
(2) Location - Side of Fuselage	In	Right	NA	NA	NA	30" x 45" Right	Left & Right	Right	Left	Rear	NA	NA	Left & Right	Left & Right	Left & Right	Right	Cargo-Left Rescue-Right	Right	72" x 72"	Rear	NA
E. CARGO COMPARTMENT																					
(1) Height of Floor Above Ground	In	NA	NA	NA	NA	46"	46"	NA	48"	45 1/2"	NA	NA	28"	27"	32"	30"	38"	36"	36"	30"	NA
(2) Length Usable	In	NA	NA	NA	NA	156"	92"	50 1/2"	110 1/2"	28'9"	NA	NA	48"	60"	92"	120"	240"	163.5"	30'4"	366"	NA
(3) Width Floor	In	NA	NA	NA	NA	60"	48"	53 1/2"	55.0"	81"	NA	NA	80.5"	80.5"	96"	66"	46"	59"	87"	90"	NA
(4) Height (Clear of Obstructions)	In	NA	NA	NA	NA	52"	51"	46.7"	55.0"	75"	NA	NA	56"	56"	52"	60"	60"	70"	69"	78"	9'4"
(5) Cargo Space Optimum	Cu Ft	NA	NA	NA	NA	293'	125'	136'	158.8'	1,150'	NA	NA	140'	140'	220'	300'	422'	363'	1,252'	1,487'	NA
F. EXTERNAL CARGO ²																					
(1) Maximum recommended external load	Lbs	500	4,000	4,000	4,000	NA	1,000	NA	NA	NA	NA	NA	3,000	3,500	4,000	2,000	5,000	5,000	10,000	16,000	20,760
(2) Rescue Hoist Capacity	Lbs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	400 or 600 ³	400	600	600	600	NA
(3) Cargo Loading Winch Capacity	Lbs	NA	NA	NA	NA	NA	NA	NA	NA	1,500	NA	NA	NA	NA	NA	NA	NA	NA	2,000	3,000	NA
G. PASSENGER CAPACITY																					
(1) Troop Seats (240 Lbs Per Man)	Ea	1	0	0	0	10	5	5	5	32	1	2	6	8	12	6	12	12 or 18	23	33	NA
(2) Litters and Ambulatory	Ea	0 + 1	NA	NA	NA	6 + 3	2 + 2	0 + 5	0 + 5	14 + 8 20 + 29	2 + 0	2 + 1	2 + 1	3 + 1	6 + 1	6 + 0	12 + 0	8 + 0	24 + 0	24 + 3	NA
H. OPERATIONAL CHARACTERISTICS ^{1,2}																					
(1) Maximum Allowable Gross Wt	Lbs	2,100 (O-1A) 2,165 (O-1E)	12,500	13,318	12,676	8,000	5,100	7,000	7,700	28,500	2,500	2,700	7,200 ⁴	8,500 ⁴	8,600 ⁴	7,900	13,500	13,500	31,000	33,000	38,000
(2) Basic Weight	Lbs	1,502 (O-1A) 1,614 (O-1E)	9,673	10,650	10,004	4,900	3,100	4,990	5,490	18,576	1,718	1,821	4,020	4,487	4,655	5,650	8,899	7,738	21,500	17,200	17,240
(3) Useful Load ¹	Lbs	598 (O-1A) 551 (O-1E)	2,827	2,668	2,672	3,100	2,000	2,010	2,210	9,924	782	879	3,180	4,013	3,945	2,250	5,401	5,862	9,500	15,800	20,760
(4) Internal Fuel Capacity	Lbs/Gal	252/42	1,930/297	1,930/297	1,930/297	1,380/213.5	828/138	1,380/230	1,380/230	4,968/828	258/43	276/46	812/125	1,008/155	1,430/220	1,050/175	1,800/300	1,572/262	2,388/398	4,095/630	5,720/880
(5) Normal Cruising Speed	Kts	87	200	200	200	104	105	155	160	150	70	70	80	90	100	70	80	85	90	130	95
(6) Endurance at Cruising Speed	Hrs + Min	4 + 30	1 + 55	1 + 55	1 + 55	7 + 00	6 + 00	5 + 40	5 + 45	6 + 30	2 + 00	2 + 05	1 + 40	1 + 50	2 + 00	3 + 30	2 + 40	2 + 50	1 + 05	2 + 40	1 + 45
(7) Grade of Fuel	Oct	80/87	JP-4	JP-4	JP-4	80/87	80/87	115/145	115/145	115/145	115/145	115/145	JP-4	JP-4	JP-4	115/145	115/145	115/145	115/145	JP-4	JP-4
(8) Fuel Consumption Per Hour ⁸	Lbs/Gal	45.6/7.6	1,300/200	1,300/200	1,300/200	180/30	132/22	204/34	204/34	660/110	102/17	102/17	422/65	487/75	487/75	360/60	480/80	456/76	1,200/200	1,300/200	3,440/532

DEFINITIONS: (TM 57-210, dated Oct 60, page 100)

MAXIMUM ALLOWABLE GROSS WEIGHT

The maximum allowed total weight of the aircraft prior to takeoff; the "BASIC WEIGHT" of the aircraft plus the crew, personnel equipment, special devices, passengers/cargo, and usable fuel and oil. This is limited by structure, power available, or landing load.

BASIC WEIGHT

The empty weight of an aircraft in its basic configuration, to include all appointments, integral equipment, instrumentation, and trapped fuel and oil, but excludes passengers, cargo, crew, and fuel and oil.

USEFUL LOAD: The load-carrying capability of an aircraft. It includes the payload, crew, and usable fuel and oil required for the mission. Here it is the difference between "MAXIMUM ALLOWABLE GROSS WEIGHT" and the "BASIC WEIGHT" as defined above. Thus, it is evident that a reduction of the fuel load will reduce the ENDURANCE and increase the PAYLOAD. Full oil is required for all missions.

PAYLOAD: The useful load less the crew, full oil, and the required fuel for the mission.

NORMAL CRUISING SPEED: The true airspeed which an aircraft can normally be expected to maintain at some standard power setting below rated military power. This speed will vary with altitude.

ENDURANCE AT CRUISING SPEED: The time that an aircraft can remain airborne at normal cruising speed with fuel aboard without using the required fuel reserve. The data listed under "OPERATIONAL CHARACTERISTICS" is computed utilizing full fuel minus a 30-minute reserve.

FOOTNOTES:

¹All data computed at standard conditions at sea level.

²Detail weight computations and characteristics taken from current technical manuals on each aircraft.

³Data subject to change, resulting from developmental testing.

⁴Basic weight for standard aircraft. (Weapons systems and components not established.)

⁵UH-19D: Helicopters prior to serial no. 56-1519 are equipped with provisions for a 400 lb. capacity rescue hoist; subsequent helicopters are equipped with provisions for a 600 lb. capacity rescue hoist.

⁶"NATO" type litter arrangement (aircraft no. 61-2599 and subsequent).

⁷Airspeeds of helicopters will vary with gross weight and altitude. See appropriate operator's manual for correct airspeed.

⁸Computed at maximum gross weight and at sea level.

Figure 7-3

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